THE CANADIAN JOURNAL:

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART,

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

EDITED BY

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ASSISTED BY

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PUBLISHED BY HUGH SCOBIE,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

TORONTO, 1853.

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TORONTO, UPPER CANADA, AUGUST, 1852.

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THE CANADIAN JOURNAL.

INTRODUCTION.

"In the infancy of a state arms do flourish, in the middle-age thereof letters, in the decline and fall commerce," a true saying of the sage of Verulam, is this which we have chosen for a motto, and *arms*,—the arms, namely, that swing the axe and guide the plough—have flourished, and long may they flourish in Canada; nor has the middle-age of mental vigour, and intellectual exertion been tardy in succeeding to that first stage of advancement. It would even be well if no premature signs of undue prominence in the last of the three, already portended, like early grey hairs, the decay of a ripe and vigorous manhood. Canada has made a progress so surprizing in all that promotes, and in all that indicates, the well-being of a people: the dream of yesterday has become so often the reality of to-day, that did we not know how genial is the soil in which this prosperity is rooted, how healthy the growth which no Pactolus fosters but fevers, with its golden streams; no perpetual summer forces but withers; we might doubt whether it could long endure without those checks which in other communities have usually occurred, to throw them back in the race after wealth, and fallow as it were the ground which over-production has exhausted. It is not our intention then to dwell on a theme familiar to most of our readers; they need not be reminded by us that the generation has not yet passed away which found in Upper Canada a wilderness, where it leaves a garden; before whose steps, as by an enchanter's wand, roads have opened out, and stately edifices arisen, and abodes of elegance and comfort scattered themselves far and wide. Nor need they be told that the benificent Fairy whose gifts these are, yet dwells among us, and by her names of Industry and Order, and Peace, may yet be invoked for other gifts, and won to carry her blessings to regions beyond their present boundary. Material prosperity never fails to develope in a community, and indeed requires for its creation a high degree of intellectual exercise. Commercial enterprise, political rivalry, the daily business of the advocate, the daily duty of the physician, all task faculties which in the quiet paths of learning or philosophy, might rear a monument of human wisdom, or win new planets from the abyss. They task, but they do not satisfy them; that they exist, is a fact to which we appeal as a proof that the *middle-age* of our state has arrived; that they do more than exist, that they absorb so greatly those faculties whose aim should be higher than the material interests of a day, or a generation, is another fact to which we appeal, in proof that the time has come when letters must urge their claim to a better representation, on peril of the place which is their birthright.

When Europe awoke from its long sleep in the thirteenth century, and in Italy and in France, in England and in Spain, gave the first tokens of dawning civilization, by the foundation of those universities and colleges, which to the number of sixteen or seventeen, date their origin from that iron-clad age, the truth that association is the guardian of literature, that the concentration of knowledge is the best preservative of its influence, and the best stimulus to its extension, appears to have been first readmitted, after ages of oblivion, to its due place in the framework of human society. It is impossible not to recognize at once a proof the possession which that discovery took of the minds of men, and of the wide diffusion of a desire to cultivate learning, in the fact that Europe, thinly peopled as she was, could boast of nearly sixty universities before the close of the fifteenth century. Those were the days, however, when society, still in its infancy, was under tutors and governors; before the veil of blind reliance, or implicit faith, in the wisdom of one or two great minds had been raised from those of their fellow men. Reason then neglected the principal field of modern science, those facts of which we can take cognizance by our senses, and the relations we can establish by experience between them, to build upon foundations as unstable as a quicksand, and to waste prodigious strength upon subtilties which vanished like a film of gossamer in the grasp. The consequence was a long delay in that acquaintance with the bounteous and varied resources of the material world, which is the reward of subsequent study of its laws and phenomena. Men were not wanting who, like our own Roger Bacon, were prematurely enlightened, but debarred from sympathy, and too divided for co-operation, while they have indeed left to posterity the shadow of a great name; to their own generation and those which immediately succeeded, they were but as light to one who is without organs of vision, or wings to one who is chained to the earth. It was in Italy, and in the latter half of the sixteenth century, that the truth which had been so long practically recognized in respect to literature, was first applied to matters of science; and if association were indeed the guardian of the one, it has ever since been the very life of the other. The Academy of the "Secrets of Nature" founded, (how are the mighty fallen!) at Naples, the present seat of all intolerance and restriction, in the year 1560, was the forerunner of those numerous enlightened bodies, which in every country of Europe were about to be drawn together by kindred impulses, and by a common want; and which were destined by the spirit of free enquiry which animated them, to aid that emancipation from the bondage of tradition, which was dawning in philosophy, as it had already dawned in religion. There was a boundless field before them. If long afterwards, the greatest of philosophers could liken himself to a child gathering a few bright pebbles by the shore of the ocean, who can exaggerate the exhaustless novelty, the wonder, of nature's works, to ardent minds in which love for her beauties

was a passion, and whose inspiration had already appeared by the glorious creations of Titian and Raffaelle, and Michael Angelo.

> The earth and every common sight
> To *them* did seem
> Apparelled in celestial light,
> The glory and the freshness of a dream.

These societies spread over Italy with such rapidity, that before the end of the sixteenth century there was one in almost every city of importance: nor was it long before the other countries of Europe were animated by the same spirit. In Spain, the Academy of the Wonders of Nature was founded in 1552. A similar society, with the same name, was established at Vienna in the same year. Our own Royal Society of London, the foundation of which was laid as early as 1645, dates its incorporation from 1662. Lastly, Colbert founded what is now the Institute Nationale of France in 1666. Thus, within the short space of fourteen years did these four *Mvsœa Minervœ** spring forth, as it were, from the head of Europe, not quite like the Goddess of Wisdom, full armed and radiant, exempt from the weakness of infancy, and the errors of youth, but possessed at least with one of her highest lessons, an humble estimation of their actual knowledge, an unquenchable desire for further light. We need scarcely remind the reader, that the Royal Society of London was the honoured instrument of giving to the world the Principia of Newton; that from its funds, and from the assistance of its first members, was Flamstead enabled to commence those observations which have made Greenwich the classic ground of Astronomy: that wherever these institutions have existed, they have awakened talents which, but for them might never have been aroused; have promoted enquiries which individuals could not have conducted, and given to the world investigations and discoveries which, without their aid might never have seen the light. These truths are too familiar to be questioned, and without intending to pursue the history of learned societies, we have referred to them here to point out a legitimate deduction from them, namely, the importance of organizing an association capable of fulfilling those functions in our own community.

It can scarcely be denied that the pursuit and cultivation of the Physical Sciences has made comparatively little progress in Canada, and by no means attained the established place which might have been looked for at this stage of our history. It is true that two Societies, directed more or less to this subject, have existed in Lower Canada for more than twenty years—the Literary and Historical Society at Quebec founded in 1824, and the Natural History Society of Montreal founded in 1827, but we have the highest authority for inferring that the latter at least has not as yet realized the expectations of its zealous founders, nor can the last Report of the authorities of the former, be deemed entirely satisfactory. Neither has practically exercised any influence in Upper Canada. But a short time ago, a celebrated naturalist had occasion to compare the skeleton of a recent specimen of the *Delphinus Leucas*, or Beluga, with some remains found under equivocal geological circumstances in the State of Vermont. In vain did he enquire of every collection with which he was acquainted, in America; the unwieldy rarity he sought was no where to be heard of. At last he remembered a museum in Copenhagen unrivalled for its riches in marine mammalians. With the cordial liberality of a brother philosopher, the distinguished naturalist who presides over that establishment, promptly met his request for a specimen, and the precious remains were shipped with much precaution, in a number of boxes and barrels, and duly wafted from Denmark to Massachusetts. Then, and not until then, did M. Agasssiz, the naturalist in question, become aware of the fact that the *Delphinus Leucas* under the name of the *White Whale* is one of the commonest frequenters of the Gulf of St. Lawrence, and that an easy journey to the banks of our noble river, would have placed him in possession of any number of specimens his researches might have required. Need we say that such a fact speaks volumes as to the neglect among us of those pursuits by which, not only are the productions of a country laid open to the use and enjoyment of its people, but the channels of scientific information kept also replenished with that knowledge of local peculiarities which is so indispensable to the progress of science.

We have referred above to the comparative non-success of the Elder Societies in Canada not in ignorance of the ability and intelligence with which ever since their formation,one zealous President or Secretary after another, has endeavoured to animate them to successful exertion, still less to undervalue those endeavours, but to enquire in perfect respect into the cause of a circumstance so frankly and honourably admitted by both, and the probability that the Canadian Institute of Upper Canada—the Society to whose recent organization we are about to refer, will be enabled to avoid a like result. First, then, it seems probable that the great vice of Society in America, that "eternal sabbathless pursuit of a man's fortune," so long ago denounced ; which leaves to the mind neither leisure, taste or capacity, for the cultivation on which its happiness depends, has not failed in its effect here; not in reality devoting much of our time to anything more profitable, or half so delightful as the cultivation of literary or scientific pursuits, we have nevertheless grudged it to them, and have neglected the formation of those habits with which alone they are reconcileable. Natural History and Botany have been abandoned almost entirely to the members of an arduous and ill-remunerated profession, very few of whom can command the leisure or even incur the expenses essential to their active pursuit. The unwise habit of overtasking the strength and energy of those engaged in Instruction, or filling Professorial Chairs, as if the mind can expatiate at large, while the body is bound to a tread-mill, has had something to do with it. Scientific pursuits can never make much progress while those who are professionally devoted to them, are debarred, whether by unfortunate necessity or illiberal pressure, the opportunities of self-improvement and private progress, which the ablest value the most.

It rather appears too, and we refer to this, because it is the evil which it has been principally sought to avoid, in the constitution of the Society just referred to, that the objects expressed by the titles Natural History Society, and Literary and Historical Society, are too special to be able to stand alone in this country at present. They do not include a multitude of objects in which much of the most active talent in the country is engag-

* *Mvseum Minervœ* was the designation of a College or Academy founded by Charles the Ist. in 1635, for the cultivation of the Physical Sciences, but which fell to the ground in the troubles of that unhappy reign.

ed, for example, those involved in the professions of the Engineer, the Artist, the Surveyor, the Architect, all of them represented by Societies of high standing in Great Britain, and therefore capable in their nature of extending the basis of similar bodies here. It must not be forgotten that until about the year 1810, one great Society satisfied almost the entire demand for this species of organization in London itself, we might almost say Great Britain, for the local societies were few in number and limited in character. The Geological Society, (1807;) the Astronomical Society, (1820;) the Asiatic Society, (1824;) the Geographical Society, (1831;) and a host more, are of very modern foundation; it would seem, therefore, that no such limitation of object has the sanction of previous experiment, and we may hope that an attempt to unite under one roof, and in one organization a full representation of the active mind of the community, may be more fortunate. It is unhappily true that the great prominence given to classical learning in England, and in all education framed on her models, has led to a surprising want of either knowledge of, or interest in, physical or mathematical science in English Society generally; which is best attested by the almost incredibly limited sale of scientific books and periodicals: it must be therefore expected that an English Colony will yield, at first, but a slender harvest of scientific results, whether of the nature of observation, experiment, or reasoning, and furnish but a small number of minds imbued with those tastes which produce them; but there is a fund of practical knowledge and thought, a wisdom of the workshop, the field, and the loom, in every community, which deserves, while it does not claim the honours of science. It is to this also that the Canadian Institute, and this journal as its present organ, addresses itself, and to this offers a medium not only as it is hoped of instruction, but of intercommunication and publicity. In referring, however, to the causes of the difficulty experienced by Literary or Scientific Societies in this country, it is impossible not to notice the habit of reading for amusement alone, which is fostered and fed by the cheap trash which loads the tables of our booksellers, and pervades society so generally. Until parents and teachers set themselves more strongly against this habit, not only for the injury it frequently does to the moral strength of the young, but still more universally, its destruction to the intellect, there will continue to be a waste of the best faculties, and a distaste for the most rational and elevating pursuits. We might add the want of Libraries, and enquire why the Provincial University with its great endowments, has not long ago acquired something more deserving of that name. In the United States there are 234 Libraries, containing from 5,000 volumes and upwards, including five that contain more than 50,000. In the same ratio to population, there should be nearly twenty such in the two Canadas. We doubt if there are half-a-dozen. However, in these matters cause and effect follow one another, in such recurring succession, a circle, so "vicious" is maintained, that it is useless to distinguish one from the other, and we simply refer to the facts to justify the assumption with which we started, that something more is wanted, and that something, we believe, may be in part attained by the Incorporation of the Canadian Institute.

INCORPORATED BY ROYAL CHARTER.

President:
W. E. Logan, F.R.S., F.G.S., (Director of the Geological Survey of Canada.)

First Vice President—Capt. Lefroy, R.A., F.R.S., (Director of the Magnetic Observatory, Toronto.)

Second Vice President—J. O. Browne, F.S.A.

Corresponding Secretary—Frederick Cumberland.

Secretary—Sandford Fleming.

Assistant Secretary—Walter Moberly.

Treasurer—Dalrymple Crawford.

Curator—F. F. Passmore.

Council:

Alfred Brunel,
Professor Cherriman,
Professor Croft,
Edward L. Cull,
H. Melville, M. D.
William Thomas.

As the early history of the Canadian Institute may not be uninteresting, when, in future years, the Society has assumed that important position among the Institutions of this country, which its first promoters and present Members earnestly hope for it; the subjoined brief outline of its origin is appended, as a fitting introduction to the office which this journal is destined to perform in submitting its transactions to the public.

The Canadian Institute, like many other Societies of a similar character, dates its origin from a small beginning. One or two individuals whom inclination led to seek for that intercourse between persons of a more practical and scientific turn of mind than is generally to be found in ordinary debating societies, and being themselves connected with the surveying and engineering professions, were induced to believe that the formation of a society consisting of gentlemen engaged in those pursuits, would draw together many kindred minds, and offer an opportunity of accumulating such knowledge as is necessary for the diversified practice of the professions, and of mutually benefiting each other by the interchange of individual observation and experience.

With the view of considering the establishment of such a

Society, a few Surveyors, Engineers and Architects, residing in and near Toronto, met on the 20th June and 20th July, 1849, when a Prospectus of the proposed Society was adopted, and copies forwarded to members of the profession generally, throughout the province, soliciting their advice and co-operation.

Subjoined is a copy of the Prospectus in accordance with the principles of which the Society was first organized, on the 22nd of September, 1849.

PROSPECTUS.

To be composed—1st. Of Provincial Land Surveyors, Civil Engineers and Architects, practising in the Province, as Members.

2d. Of Members of the same profession not practising in the Province, as Corresponding Members.

3d. Of men distinguished in Science and Arts, residing in the Province, but not belonging to either of the above professions, as Honorary Members.

4th. Of Students under Articles, as Graduates.

The Officers of the Institute to consist of a President and Vice-Presidents, Council, Secretary, and two Auditors, to be elected annually.

The Treasurer to be a Chartered Bank in the City of Toronto. The Rooms of the Institute to be situated in the City of Toronto.

Libraries to be formed, and collections made of Maps, Drawings, Models, &c. A Museum to be established for the collection of Geological, Mineralogical, and other specimens.

Professional discussions to be held and papers read. Transactions to be published.

Standard Instruments to be kept for reference. Philosophical observations to be made and registered.

A Board of Arbitration to be established for the settlement of difficulties arising between members in the practice of their professions.

The Subscription of Members to be One Pound per annum. The Subscription of Graduates to be Ten Shillings per annum.

It will thus be seen that the proposed Society was strictly of a professional character. The foregoing Prospectus, with a suitable circular, was transmitted to nearly 500 persons throughout the Province; in reply, from twelve to fifteen letters only were received. The promoters were disheartened, the monthly meetings were but indifferently attended, although notices of such meetings were regularly issued, and by some of its members the society was entirely abandoned, at a time when their assistance was most needed. At last, the attendance at the monthly meetings dwindled down to two, and then the prospects of the young Institute were gloomy indeed. At that small meeting various schemes were talked of as to the ultimate chance of success, and it was then considered that by opening out the Society to those whose pursuits or studies were of a kindred character, and by holding regular weekly meetings for the reading and discussing of papers, the Society would gradually take a practical stand and proper footing. The experiment was tried, and weekly meetings were held regularly during the winter months, the attendance being occasionally good, although often dispiriting. Several interesting communications of professional and general interest were read, some of them eliciting spirited discussions. Many of the meetings were, however, occupied by discussions connected with proposed changes in the Constitution and Regulations of the Society, until at last on the 12th of April, 1851, it was determined that proper steps be taken for obtaining a Charter similar to the one the Society now enjoys. By this effort its hitherto strictly professional character was changed to one of a general description, and the way was paved for the Canadian Institute as it now exists.

On the 10th of May, 1851, the first conversazionè was held, and numerously attended. A very encouraging wish was then expressed by the friends of the members who were present, that they should earnestly continue to extend the influence and importance of the Institution.

A Royal Charter of Incorporation was granted on the 4th of November, 1851, and by it W. E. Logan, Director of the Geological Survey of Canada, was decreed First President. The remaining officers and members of the Council, required by the Charter, were elected on the 27th of March last, and accepted office the following week at a conversazionè.

Prior to the election of Officers the weekly meetings were occupied in the usual manner, and in preparing and maturing a proper code of Laws in accordance with the requirements of the Charter for the future government of the Institute.

Amongst the papers communicated during the Sessions, terminating May 10th, 1851, and April 3rd, 1852, were,—

A review of the several clauses in the Surveyor's Act of 1849, by Mr. J. Stoughton Dennis.

On the use of the Telescope, as applied to field practice, by Mr. J. O. Brown.

Upon the ameliorating influences of the climate of Canada, by Mr. F. F. Passmore.

On the formation of the Peninsula and Harbour of Toronto, by Mr. S. A. Fleming.

On Lake Harbours, &c., by Mr. Edward L. Cull.

On the Mineral Productions and Geology of Canada, illustrated by the Map and Models of his Official Survey, by Mr. Logan.

On the effects of Tides, by Mr. Ellis.

On the application of wire to the construction of Bow String Bridges, by Mr. Hanvey.

On the Geology of the Niagara Falls, by Mr. Ridout.

On the Ebb and Flow of water in the American Lakes, by Mr. Brunel.

On the management of Engineering works, by Mr. Ellis.

On Piling, as practised and applicable to works upon our lakes and navigable waters, by Mr. Kivas Tully.

On the supply of water to Toronto, by Mr. Cull.

On Crib work, as applied for foundations and piers, by Mr. Brunel.

On the works at Portsmouth Dock Yards, by Mr. Cumberland.

On Tubular Bridges, by Mr. Brunel.

On the effects of different grades upon the economical working of Railways, by Mr. J. O. Brown.

Amongst others promised and in preparation, are,—

A paper upon Concrete, as applied in foundations under water, by Mr. Cumberland.

On the economical application of native materials of construction, by Mr. Thomas.

On the varieties of native timber with specimens, by Mr. J. S. Dennis.

On the application of Screw Piles and Moorings, by Mr. Brunel.

The Canadian Journal.

TORONTO, AUGUST, 1852.

We cannot more appropriately introduce the Canadian Journal to the public, than by submitting a brief exposition of its claims to support, conjointly with an appeal to the professional men scattered throughout the country, whose experience and opportunities confer on them that power of co-operation upon which the ultimate success of this journal mainly rests.

If proof were wanting of the necessity which exists in this Province for a publication devoted to the Arts and Sciences of practical life, in addition to what is foreshadowed in the introduction to the present volume, it would suffice perhaps to enumerate the numerous foreign scientific and artistic periodicals which meet with a liberal patronage in Canada, and which are not unfrequently made the medium of communicating to the world the discoveries and inventions of the "sons of the soil." It might, with equal force, be urged that many useful additions to knowledge—especially the knowledge of our own country—are withheld from the light by the absence of that encouragement and assistance which the Canadian Journal aspires to contribute.

We do not, however, appeal to a spirit of nationality, deeply rooted, and most worthily so, as that sentiment is in the breasts of Canadians,—nor do we rest our claim to public encouragement upon the meritorious object of snatching original thought from obscurity, we have a more extended and far more practical design in view. We are endeavouring to supply such a publication as will afford a medium of communication between all engaged or interested in scientific or industrial pursuits, will assist, lighten and elevate the labours of the mechanic, will afford information to the manufacturer, and generally administer to the want of that already numerous and still increasing class in British America, who are desirous of becoming acquainted with the most recent inventions and improvements in the Arts, and those scientific changes and discoveries which are in progress throughout the world.*

It were vain to suppose that the professional man generally, or the enterprising manufacturer, much less the scientific farmer, or the enquiring mechanic could command needful information respecting foreign or domestic progress in practical science and art from the pages of those publications which, out of the abundance of their resources, necessarily limit their range to one or two departments of industry or knowledge; which are not generally accessible on account of their expense, and which aim at a standard adapting them to the demands of a highly artificial and wealthy condition of society, rather than to the exigencies of a young and rapidly progressive people.

Even were the excellencies of foreign periodicals presented to the Canadian public in a form accessible to all classes, yet, such a publication would not meet the demands of the present day. As a thriving agricultural and commercial people—sprung, as it were, into existence during the last half century—we require special adaptation of many artifices and inventions to those unavoidable conditions which attach themselves to communities in new and extensive countries. We require information respecting many physical features of our territory, which, in the course of time, must impress with their influence our industry and prosperity. Our commercial relations demand an intimate and widely diffused acquaintance with the advantages we enjoy in relation to geographical position, soil, climate, productions, economic mineral resources and means of communication; and lastly, the imposing increase in the population of the Canadas, which numbers, while we write very nearly two million people, imperatively solicits that exertion which, if rightly directed, may place our literary and scientific achievements usefully and even prominently before the world.

Where may we hope to look for information relating to the Canadas if Canadians themselves do not supply the materials and furnish the record? How shall we elevate our position in the world of science and of letters if the "sons of the soil" do not arouse and exert themselves?

In every part of Canada men are to be found possessing high scientific attainments or profound practical knowledge. To many such we look for co-operation with confidence, now that a fitting medium for the publicity of the information they possess and are daily acquiring is hopefully offered to them.

The stupendous railway operations now in progress in many parts of both Provinces, present rare opportunities for obtaining much needed information respecting the geological features of the country through which they pass. The frosts of a single winter will, in many instances, obliterate all surface traces of strata possessing economic importance, until accident leads to their discovery at some future and perhaps distant period. We earnestly desire to enlist amongst the contributors to this journal the gentlemen engaged in the construction of those extensive lines of communication.

The ample opportunities for observations of the most useful description which are enjoyed by surveyors, induce us respectfully to solicit their correspondence on all matters relating to the physical features and natural history of the districts in which they may be engaged.

To the operative, deriving from experience a purely practical knowledge which experience alone can give, we address ourselves in the hope of obtaining assistance and counsel in matters wherein the busy lessons of the workshop are far more valuable than the unapplied speculations of retirement and study.

It is not our intention to trespass upon the field now occupied by our contemporary the Agriculturist, yet so vast and unex-

* Vide Prospectus.

plored is the domain of Agricultural Science, that the rambler among its novelties may find, without encroachment, fruit and flowers in abundance wherewith to enrich our store and advance the public good.

To all who are interested in the objects of this journal we beg again to state, that the progressive improvement and extension of of the work will be commensurate with the support which may be accorded to it by the public, and the degree to which the Canadian Institute and the promoters of the Canadian Journal may be successful in soliciting and combining the talents of those classes to which they appeal.

Indian Remains.

NOTICE BY THE REV. C. DADE.

The following account of a remarkable Indian burying ground, which I visited soon after its discovery, may be interesting to you, though, no doubt it has been thoroughly ransacked since, and you may probably be acquainted with it. The spot is in Beverly Township, and was then a part of the farm of Mr. Call, ten or twelve miles from Dundas and two and a half from the Guelph road. The burying ground is situated on a ridge thickly wooded with beech, maple, &c., running east and west about a mile, and bounded by a rivulet called the Dundas Creek. On the summit I found several pits newly opened, and a vast quantity of human bones at the depth of about four feet. Among the bones were iron tomahawks, brass kettles, pipes, beads, wampum, conch shells, &c.

I brought home several specimens, and amongst the rest two skulls, (the owner of one had evidently fallen by the blow of a tomahawk,) a pipe elegantly formed of clay, a pipkin, &c. There were three or four pits which had been opened beyond the memory of the oldest settler. Trees were growing over the graves of the same size as those in the surrounding woods, (one beech being two feet in diameter.) It was thought that in the eleven pits, at least 2000 persons had been interred; in one of the smallest pits a person counted 125 skeletons. I visited this place in 1836.

P. S.—A neighbour of mine, last year, ploughed up a copper wedge, of the size and shape of common iron wedges used in splitting rails, about a quarter of a mile from the lake.

July 3rd, 1852.

On the Atmospheric Phenomena of Light: by J. Bradford Cherriman, M. A., F. C. P. S.,

(Fellow of St. John's College, Cambridge, and Dep. Prof. of Mathematics and Natural Philosophy in the University of Toronto.)

The atmosphere which surrounds the Earth possesses in common with other imperfectly transparent media the property of modifying the light which enters it, in three distinct ways, namely, by absorption, transmission and reflection, though in proportions whose amount is not exactly determinable. From the experiments of de Saussure on the plains of Germany, this much seems demonstrated, that, of the Sun's rays incident on the upper surface of the atmosphere, the Sun being in the zenith and the sky quite clear, not more than two-thirds reach the Earth, the rest being either absorbed or reflected. It is to this reflection that we owe the blue colour of the sky, the insensible gradation between day and night, and the diffused light by which objects are visible when not directly illuminated by the Sun's rays: without this, the shadow of every thick cloud would involve us in absolute darkness, and the stars would be visible all day, and at night appear as brilliant sparks in the midst of intense blackness. The amount of absorption will be greater as the density of the air which the ray traverses and the length of its path increase, and from these arise the diminished brilliancy of the Sun when on the horizon, and also the faintness of the light of distant terrestrial objects and their consequent indistinctness.

De Saussure has shewn by experiment that the blue rays of the solar light are more reflected by the atmosphere than the rest, and the red rays more easily transmitted; thus, as the depth and density of the stratum of air increases the more will the blue tint disappear and the red predominate, as we see in the Sun at its rising and setting. The blue tint is more decided in the zenith than on the horizon where the colour of the sky is sometimes quite white, and the intensity of the blue increases as we ascend from the earth; at a certain height, the sky appears nearly black.

On the evening of a clear day as the Sun approaches the horizon, the sky in his neighbourhood appears of a glowing red or orange colour, extending along the western horizon, but diminishing rapidly towards the zenith and the east: at the same time, in the point of the heavens opposite to the Sun, we often see the same red tint prevailing, and attaining its greatest intensity just at the instant of the Sun's sinking. Shortly afterwards, below this red part appears a circular segment of decided blue, the line of separation being in general sharply defined: as the Sun sinks lower, the red gradually disappears, and in the west is succeeded by a bright grey which fades off as it meets the blue eastern segment. This latter is due to the shadow of the Earth projected on the sky and coloured only by the blue diffused light; the grey, which constitutes twilight, is due to the reflection of the Sun's rays at the upper strata of the atmosphere by which we enjoy his light when it can no longer reach us by direct transmission: it deepens by degrees as the Sun sinks, and becomes altogether dark when the Sun is more than 18° below the horizon. The duration of twilight depends on the latitude of the place and the time of year; in the latitude of Toronto, the longest twilight lasts 1h. 36m. at the summer solstice; and the shortest, about 48 minutes, occurs in the present year on March 3rd and September 5th. In latitude $48\frac{1}{2}°$ and any place higher than this, twilight at the summer solstice will continue all night.

Sometimes, but very rarely, when the Sun has set, there is seen a pale glimmer extending upwards from him in a conical shape towards the north-west and reaching to a considerable height. A fine instance was observed in the present year; it is due, undoubtedly, to the light thrown on the sky by the strata of air actually below the horizon and directly illuminated by the Sun's rays.

When a ray of light proceeding from an object passes obliquely through a medium varying from point to point in density like the atmosphere, its path is no longer a straight line as in vacuo, but a curve whose nature depends on the law of variation of the medium, and as the direction in which the object is seen is determined by the direction of the ray on entering the eye, it follows that the places in which objects appear to be are not the places they actually occupy: the necessity of making an allowance for this gives rise to one of the most important astronomical corrections, called Refraction. The effect of this refraction is to raise all objects vertically above their real places by an amount which is greater as the object is nearer to the horizon:* thus the Sun's disc is completely visible to us when he has sunk quite below the horizon, and appears distorted in shape into a sensible oval, the horizontal

*It is recorded by a late African traveller, that in shooting on the sandy deserts there, at first he invariably fired too high, the birds appearing much above their real places from the unusually great refraction.

axis being one-eighth greater than the vertical. Various tables have been constructed for giving the amount of correction to be applied at different altitudes: the best English ones are constructed from the following expression which is to be deducted from the observed zenith-distance.

$$c.\tan.z\ (1 - .00128\ \sec^2 z)$$

Where z is the apparent zenith-distance, and c represents the variable quantity $\frac{60''66}{1+.0020803x} \cdot \frac{h.}{29.93}$ in which x is the temperature of the air expressed by the number of degrees above freezing point, (Fahrenheit) and h the height of mercury in the barometer in inches. This formula is obtained independently of any hypothesis as to the law of variation of density, only assuming that the density is the same at equal distances from the Earth's centre; and it is sufficiently accurate for astronomical purposes for all altitudes above 26°, but below this the law of variation must be taken into account, and as we are altogether ignorant of this law, the formulæ and tables for low altitudes are more or less empirical. A remarkable and ingenious one was constructed by Laplace (Mec. Cel.,) and the French tables are founded upon it: but very near the horizon, the irregularities of refraction, arising from local and accidental circumstances, are so great as to foil all attempts to express them by a mathematical formula.

It is a singular fact that the changes of humidity in the atmosphere do not produce any sensible effect on the refraction; the reason being that the density of suspended vapour is less than that of air very nearly in the same ratio that its refractive power is greater, so that the effective refractive power of aqueous vapour is about the same as that of the atmosphere. The effects produced by refraction are sometimes exceedingly curious. When the stratum of air next the Earth differs very much in density from that above it, the rays from an object which would not otherwise reach the spectator, may be bent back from the higher stratum and thus furnish an image in addition to the one seen by direct rays, and elevated or depressed with regard to it according as the higher medium is rarer or denser than the lower one. Thus if the temperature of the sea is higher than that of the atmosphere, owing to the slower cooling of the former, the stratum of air immediately above the sea becomes rarer than the one higher up: and a spectator situated in the denser medium and looking at an object in that stratum, will see, at the same time with the image furnished by direct vision and below it, an inverted image produced by rays bent upwards from the lower medium. To this class of phenomena belong the well-known *Fata Morgana*, the appearances seen on the sandy plains of Egypt, and called by the French *Mirage*, and the *Looming* occasionally seen in parts of Great Britain.

When the higher stratum is rarer than the lower, as sometimes happens from the air above the sea being suddenly heated by the Sun, the appearances will be reversed, an inverted image being formed as before, but in this case elevated above the true image. A second sudden change of density in the ascending strata may give rise to another image still, elevated above the other two and erect, as actually observed by Captain Scoresby, who also relates an instance in which he recognized his father's vessel, when at a distance of 30 miles, and therefore far beyond the limit of direct vision, by means of an inverted image in the air, so well defined that every sail could be distinguished. This also points to the probable explanation of the remarkable case of the French sailor in the Mauritius, who was accustomed to predict the approach of vessels long before they could be detected by the telescope, and when they must have been far below the horizon.

Phenomena of a somewhat similar nature are sometimes produced by reflection, a slight haze acting as a mirror. The spectre of the Brocken is well known, and a beautiful instance is recorded as having been seen by Dr. Buchan at Brighton,(see Sir D. Brewster's Natural Magic.) The same has been observed at the Mountain-house on the Catskills, when at sunrise the face of the cliff and the front of the house were seen by the spectators standing on the ledge on which the house is built, together with their own images, vividly reflected in front of them as the morning mist just cleared away.*

The aqueous particles suspended in the air as clouds, or falling in the shape of rain or snow present many beautiful phenomena.

The gorgeous colouring of the clouds with their infinite varieties of light and shade are readily explainable on the principles above indicated, the Sun's light being transmitted in different tints according to the depth and density of the vapour through which it passes, and the clouds themselves reflecting or transmitting it variously according to the position they occupy relatively to the Sun and spectator. In the morning and evening, the clouds, floating with their largest dimensions horizontal, present greater masses of vapour to be traversed by the Sun's rays than when he is vertical, and this, along with the circumstance of the longer horizontal range of the air, gives the reason why the sky is then distinguished by richer colouring than at mid-day.

Among the arrangements of clouds which produce remarkable effects may be noticed those of diverging and converging beams, known in the country by the name of "the Sun drawing water;" they generally indicate wet weather, as they only occur when the air is charged with vapour. The former arises simply from some of the Sun's rays being stopped by clouds while others are allowed to pass through openings therein; or, to speak more correctly, from the shadows of clouds being projected on the sky so as to obscure parts of it in the neighbourhood of the Sun; it most frequently occurs when the Sun is not far from the horizon. The latter phenomenon is of much rarer occurrence, and consists of arcs of great circles apparently cutting each other in a point of the heavens below the horizon in the prolongation of the line drawn from the Sun to the spectator. This apparent convergence is purely an affect of perspective, the rays themselves being parallel but appearing to approach each other as their distance from the spectator increases, like the opposite rows of gas-lamps in a long street. Another singular form is that to which the French have given the name of *bandes polaires*, when the arrangement of the clouds is such as to cause the illuminated portion of the sky seen between them to assume the form of an auroral arch, but considerable obscurity still hangs over this phenomenon.

When a light cloud is interposed before the Sun or Moon, the disc is often surrounded by several coloured rings, each displaying the prismatic tints with the red on the inside and the violet outside, the diameter of the inner ring varying from $1\frac{1}{2}$ to 4 degrees: these rings are called *coronæ*, and are most commonly seen round the Moon; when round the Sun, they are best discerned by reflection in water, and in this way Newton succeeded in detecting three at once. The cause of this appearance baffled even Newton's sagacity, and it was reserved for the famous Young to point out, that the rings resulted from his doctrine of the interference of rays on the undulatory hypothesis, the same cause that produces the colours of a soap bubble and the prismatic tints of a spider's web. Young announced from theory that the diameters of the successive rings would be as the natural numbers 1, 2, 3, 5, - - - and this prediction has been verified by the observations of M. Délegenne. The same principle explains also a phenomenon, first noticed by Bouguer, and called by him *anthélie*, that when the shadow of a spectator is thrown on a cloud, or on the ground covered with dew, the shadow of the head is seen surrounded with coloured rings, like the "glories" round the heads of saints in old pictures: a similar effect has been observed by M. Babinet when his shadow fell on the smoke of artillery,

*I cannot refrain from recommending all lovers of scenery and science to pay a visit to the Mountain House at Catskill: the view of sunrise from the platform, and the irises of the waterfall offer many curious optical appearances, and the natural beauties of the neighbourhood are not detracted from by the fact of the hotel being an excellent one.

on a bank of fog, and even on the bubbles of a small brook. Professor Necker describes another beautiful phenomenon, the explanation of which must be referred to the same principle; "If the Sun is rising behind a hill covered with trees and brushwood, a spectator just within the verge of the shadow of the hill will see all the little branches thrown into relief against the sky, not, however, dark and opaque, but glowing with a white brilliancy like silver, even to the depth of several feet below the summit of the hill."

When the suspended aqueous vapour is condensed and descends in the form of rain, it gives rise to the splendid and familiar spectacle of the rainbow. This consists in general of two circular and concentric arcs, separated by a dark interval of about 8° breadth, the outer one being much the fainter of the two, and each exhibiting the prismatic colours, in the inner the violet being on the inside while in the outer the order of colour is reversed. The first person to point out the origin of the bows was Antonius de Dominis, Archbishop of Spalatro, in 1611, A. D.; his explanation was appropriated by DesCartes, but as the true theory of colours was not at that time known, it was left for Newton to give a full account of the phenomenon. It was by him shewn, beyond doubt, that the inner or primary bow is formed by the Sun's rays which reach the spectator's eye at emergence from the rain-drops under the angle of least deviation after one internal reflexion, and in like manner the outer or secondary bow by these emerging after two internal reflexions. So also a tertiary bow would be formed after three such reflexions, surrounding the Sun with an angular radius of 40° 21′, but the light is so much diminished at each successive reflexion as to be too faint to make any impression on the retina, and this bow has consequently never been seen.* In some instances a coloured arch has been seen between the two bows, and not concentric with them, arising undoubtedly from the reflexion of the lower part of the primary bow which falls below the horizon at the surface of a river or lake. Sometimes, also within the primary and outside the secondary, are seen successive coloured bands, being of a reddish-purple in contact with the violet of the bows, then green, purple, and so on in the order of Newton's rings. Young shewed that these resulted from the interference of rays which undergo the same deviation at angles of incidence a little less and greater than that which furnishes the ray of least deviation. Lastly, Mr. Airy, having observed that the greatest intensity of illumination does not occur exactly in the place indicated by the geometrical construction, has investigated the whole subject as a problem of interferences on the undulatory hypothesis, and his results have been fully verified by the experiments and measurements of Professor Miller, so that the theory of the Rainbow may now be said to be complete.

Similar appearances ought to be produced when the Moon is the illuminating body, but her light is so much fainter than that of the Sun as to render the occurrence even of a primary bow very rare; so far as I am aware, the secondary and supernumerary bows have never been seen.

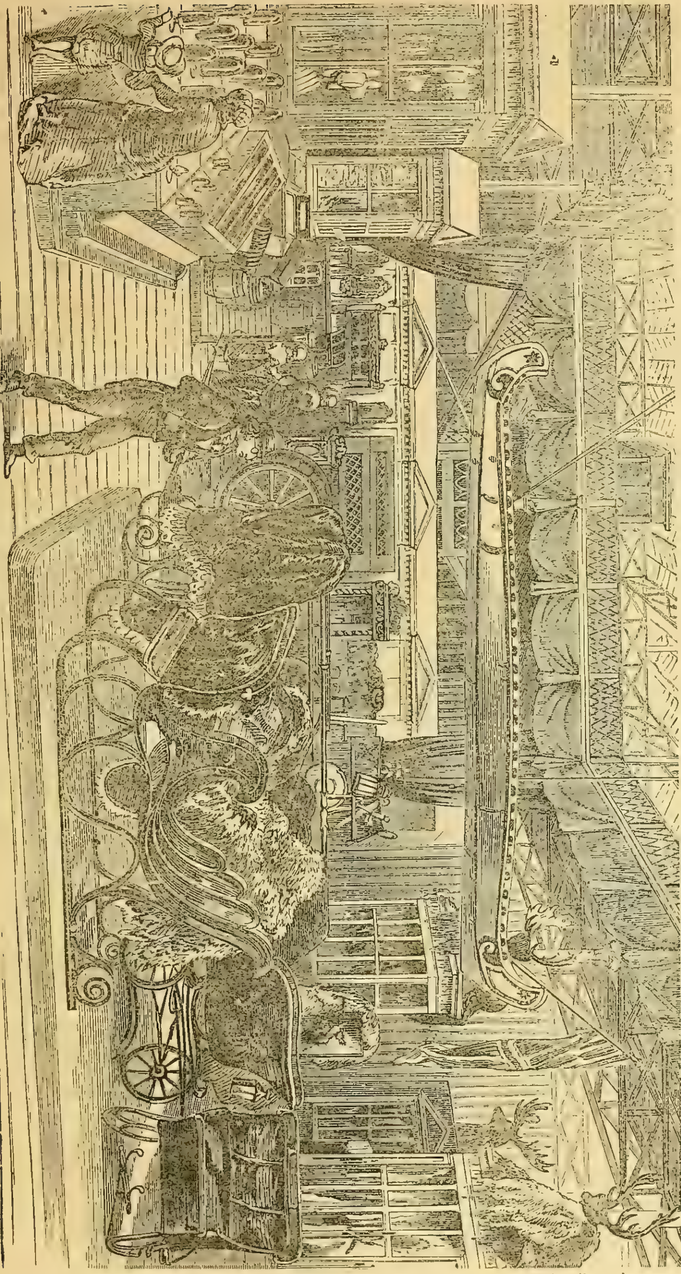
To be continued.

Railway Accidents; their Cause and Means of Prevention; detailing particularly the various contrivances which are in use, and have been proposed; with the Regulations of some of the principal Lines, by Capt. M. Huish.

(*Read before the Institution of Civil Engineers.*)

The author first considered those points connected with the road, and the machinery employed upon it, from which loss of life and injury to person and property most generally arose. With regard to the road, or permanent way, from which fewer accidents occurred than from any other cause, its complete effectiveness was the basis of all safety in railway travelling; and for keeping it up, constant vigilance was necessary, especially when any great and sudden change of weather took place, as then the weak points were sure to show themselves. It was a very rare occurrence for trains to run off the line; and when they did so, it was more generally due to obstructions designedly placed on the line than to any neglect of the superintendents or the platelayers. With respect to the rolling stock, it appeared from a return of one thousand cases of engine failures and defects within two years on the London and North-Western Railway, that burst and leaky tubes nearly doubled any other class of failure; and that these, with broken springs and broken valves, amounted to one-third of the whole number; and though they caused no direct danger to the public, yet as producing a temporary or permanent inability of the engine to carry on its train, they might be the remote cause of collision. These and other circumstances had led many persons to suggest various contrivances for communicating between the passengers, the guard, and the engine-driver, almost all of which were identical in principle, consisting of a connecting wire or rope. This plan had been tried and failed. A more feasible and favourite one was that recommended by the Railway Commissioners, which was to continue the foot-boards, so as to form a narrow platform from end to end of the train, but a committee of railway officials had subsequently expressed their unanimous condemnation of the measure. The plan now adopted on the London and North-Western Railway, was, for the guard's van, at the end of the train, to project about a foot beyond the other carriages, so that the guard looking through a window in this projection might notice the waving of a hand or a handkerchief; this was, of course, useless at night. All these causes, however, did not produce a tithe of the accidents which resulted from a want of attention to signals and a neglect of regulations, which of all sources of danger were the most prolific. The Electric Telegraph had greatly facilitated working under variable circumstances, and so beneficial had its effects been, that during the year 1851, out of 7,900,000 passengers, or nearly one-third of the population of England, who had travelled over the London and North-Western Railway, only *one* individual had met with his death (from which casualty the author also suffered) and this was the effect of the gravest disobedience of orders. In the six months during which the Exhibition was open, 775,000 persons were conveyed by excursion trains alone, in 24,000 extra carriages, all centering in a single focus, arriving at irregular hours and in almost unlimited numbers, from more than thirty railways, without the most trifling casualty, or even interruption to the ordinary extensive business of that line. The author thought undue importance had been attached to the question of irregularity in the times of the trains, as an essential element of safety, for with perfect signals and a well disciplined staff no amount of irregularity should lead to danger; but, on the contrary, it should, to a certain extent, by its very uncertainty, induce increased vigilance, and therefore greater safety. Accidents very rarely happened from foreseen circumstances, but generally from a simultaneous conjunction of several causes, and each of these was provided for as it arose. The statistics of railways, and the periodical publication of the Government returns, drew public attention very pointedly to the aggregate of accidents; but it was believed that if due regard was had to comparative results, if the accidents to steamers, or in mines, to omnibus passengers, or even to pedestrians, were as carefully recorded, that then, whether as regarded the ease and celerity of transit, or the facility of conveying numbers, the railway system, even in its present state, would be found to be incomparably safer than any other system in the previous or present history of locomotion.

* This is contrary to the statement of Dr. Lloyd, who says that tertiary rainbows have been observed; he however refers to no particular instance, and I certainly have never heard of one. M. Babinet, an acute observer, was unable under the most favorable circumstances to perceive the faintest trace of one.



The Canadian Department of the Great Exhibition.

Extracts from Exhibition Lectures, delivered before the Society of Arts.

Professor Owen gives the following account of a comparatively new branch of art, which promises to prove of great importance:

Gelatines.—Such productions as coral, shell, and pearl, are naturally attractive by their intrinsic beauty or rarity. But the most refuse and uninviting, and seemingly most worthless parts of animal bodies, are turned to uses of the most unexpected kind by the inventive skill and science of man.

The raw materials chiefly used in manufactures derived from the gelatinous textures of animal bodies, may be divided, as regards their commercial value and application, into two kinds:

1st. The gelatines and glues, properly so called, derived from the dissolution of certain animal tissues, and especially from the waste residue of parts of animals which have served for food, or for the operations of tanning, or for the fabrication, as from bones, of articles in imitation of ivory, or from the waste particles in the carving of ivory itself.

2nd. The cleaned and dried membranes of different species of fish, more especially of the sturgeon family, (*Acipenseridæ,*) preserving a peculiar texture, on which their value in the refining of fermenting liquors more especially depends; such membranes are called "isinglass."

The most remarkable progress in the economical extraction and preparation of pure gelatines and glues from the waste remnants of the skins, bones, tendons, ligaments, and other gelatinous tissues of animals, has been made in France, where the well-organized and admirably arranged establishments for the slaughter of cattle, sheep, and horses in large towns, give great and valuable facilities for the economical applications of all the waste parts of animal bodies. Among the beautiful productions of this industry, the specimens exhibited by its chief originator, M. L. F. Grenet, under No. 247, merited peculiar approbation. They included different kinds of gelatine in thin layers, adapted for the dressing of stuffs, and for gelatinous baths, in the clarification of wines which contain a sufficient quantity of tannin to precipitate the gelatine; pure and white gelatines cut into threads for the use of the confectioner: very thin white and transparent sheets called "papier glace" or ice paper, for copying drawings; and, finally, a quantity of objects of luxury or ornament formed of dyed, silvered, or gilt gelatines, adapted to a variety of purposes, and

to the fabrication of artificial or fancy flowers. M. Grenet, who was the first to fabricate on a large scale, out of various residues of animal bodies of little value, these beautiful and diversified products, many of which previously had been derived from the more costly substance—isinglass, was deemed by the jury to merit the award of the council medal.

Many manufacturers in France have risen to great eminence in this line by following the processes of M. Grenet. H. Castelle, of Paris, exhibited (No. 107) a still more varied assortment of the modifications of gelatine, amongst which were particularly deserving of notice the very large sheets of transparent gelatine, colourless, white, of various well-defined colours, and embossed or stamped with elegant patterns.

Jacob Bell, Esq., M. P., in his lecture on pharmaceutical processes and products, gives a curious illustration of the extent to which the consumer is prejudiced by the obstacles which intervene between himself and producer:—

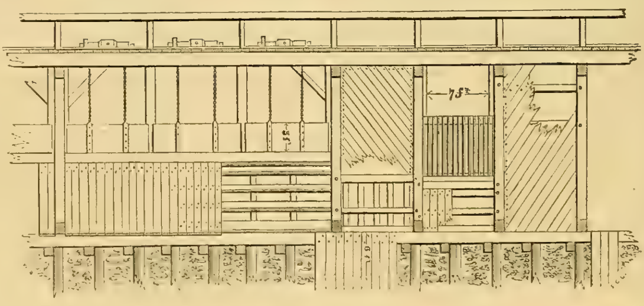
An ingenious application of the science of chemistry consists in the manufacture of artificial essences of pears, pine-apples, and other fruits. A few specimens which I have received from Mr. Piper, of Upper Winchester Street, Pentonville, are on the table. In the concentrated form, the smell is rather acrid, but when diluted, the resemblance to the fruit is recognised. The best imitations are the pine-apple and the jargonelle pear; the green gage, apricot, black currant, and mulberry, when properly mixed, are fair imitations. They are quite innocuous in the proportions used, namely a drop or half a drop to the ounce. I have been informed, that some of the ices furnished in the Great Exhibition were flavoured with these essences. The introduction of these preparations originated, I believe, in the discovery of the fact, that the peculiar flavour of "pine-apple rum" was due to butyric ether, which has since been obtained from the fruit itself. Further experiments led to the discovery of other artificial essences.

Here is a series of specimens of scammony from the English collection. No. 1 is pure; the others are more or less adulterated, down to No. 5, which is not worthy of the name of scammony. In the Turkish collection, where we might have expected to find scammony unusually fine, No. 1 is about on par with No. 3 in those above mentioned, and No. 5 would not be recognized as scammony except by the label on the botttle. It is only within a few years that pure scammony has been known in England, and its introduction arose from the circumstance of several samples of scammony being analysed, and found to be adulterated (chiefly with starch and chalk) to an extent varying from about 15 to 60 per cent. The fact being reported to the merchant abroad, he replied, that he made it to suit the demand, and mixed it according to the price. He said he would send it pure if desired, but it would be dear in proportion. From that time, "virgin scammony," as it is called, has been in the English market, but it has not yet found its way to the continent of Europe. Several foreign professors, lecturers on *materia medica*, and possessors of extensive museums, had never seen pure scammony until they saw it at the Great Exhibition, and were glad to obtain a few ounces as a specimen, to take home with them as a curiosity. Similar remarks may be made with regard to opium, of which we had specimens from various localities. This is a drug which, like many others, is adulterated to suit the demand.

NOTE—We are indebted to the liberality and courtesy of the Proprietors of the Illustrated London News for the stereotyped plate of the Canadian Department of the Great Exhibition. We have also been favoured with stereotyped plates of various articles contributed by Canadians, which we shall introduce into the Journal as occasion offers. We beg to tender our respectful thanks to the Proprietors of the Illustrated London News.

Description of a Mill-Dam and Bridge for a Creek Fifty Feet Wide.

We would remind those of our professional brethren whose minds may soar above the preparation of a plan for a Mill-dam or a Bridge across a creek fifty feet wide, and who may be tempted to smile at the common-place nature of the work we now illustrate, that one object of the Canadian Journal is to impart information on matters of common necessity among the people, in the full conviction that the efficient and permanent construction of such humble works is as essential, in their several localities, to the general progress of the country, as are those of far greater magnitude. In furtherance of this purpose, we invite the co-operation of all whose attention has been given to these subjects, not without the confident expectation that the example set by our intelligent correspondent, whose diagrams and descriptions we give below, will be generously followed by many practical men, whose experience will enable them to furnish materials possessing that rare value which experience alone can give.

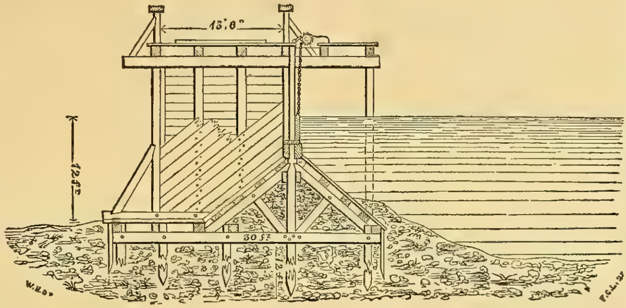


The drawings I enclose in this communication were made for a Mill-dam and Bridge across a creek, the banks of which were about 120 feet apart, and of deep loam, the bed of soft clay. A dam had been previously constructed on the same site, but had been twice carried away, owing to the sudden rise of water, washing away and undermining the banks on each side of the abutments. In order to prevent the recurrence of similar accidents it was necessary to construct a dam with a very wide water way or apron; and to connect the abutments with the banks by puddle ditches and shut piling, as well as to construct the sluices in such a manner as to admit of the water-way being readily enlarged to such an extent as to allow the passage of the water during the heaviest freshets without allowing it to rise above the abutments. These conditions are fulfilled by the design which I will now briefly describe.

The bed of the creek was first excavated to a depth of three feet below its ordinary level under the whole breadth of the dam, (one half the breadth of the creek being completed while the other half served for passing the water, which in the dry season was inconsiderable,) round piles 12 inches diameter were driven to a depth of about 12 feet, as indicated on the plan, to which the cross timbers are notched and bolted—upon these longitudinal timbers are placed and secured. The second row of piles from the upper side, being square, are left sufficiently high to receive the cap piece of the apron, which is

double and securely framed to them and braced, as shown to form the apron. Three inch sheet piling was then driven above and below the dam and securely spiked to the outside longitudinal timbers, and continued well into the bank so as to prevent the water penetrating and destroying the foundation; coarse gravel and clay was closely packed among the foundation timbers and well rammed. The whole apron was also filled with the same material, and covered with five-inch plank, secured with trenails and spikes. The piers being planked inside and out are—in the absence of stone, which could not be conveniently procured—filled to the top with coarse gravel intermixed with clay; cross ties being inserted at intervals, dovetailed upon the posts to prevent the sides from spreading. A puddle ditch was made about twenty feet into the banks on each side from the land piers, and being well puddled, secured the banks from destruction in the event of an extraordinary rise of water overflowing them.

The manner in which the Bridge is placed on the piers, is made sufficiently evident from the drawings, and the accompanying estimate of the quantity of material necessary to complete the structure, will afford sufficient data from which to estimate its cost. It was deemed advisable when building this dam to avoid using any but the most simple plan for hoisting the sluice boards; at the same time, it is evident, that should it at any time be desirable to introduce a more complete apparatus, any of the numerous contrivances for that purpose may be readily adapted.



It will be seen from the drawings that the outside planking of the piers was put on diagonally, in order to brace the framing, and thus save the necessity of framing braces in the work. The whole of the planks were put on with 1¾ inch oak trenails, the butts only being spiked.

In some cases where large stone can be conveniently obtained it may be cheaper to build a Dam of this kind without piling. Where this occurs the piles may be dispensed with, and the timber merely bedded in the bottom of the creek; the piers and apron being well packed with stone will serve to keep the dam firm: there should then, however, be a pier in the middle of the length of the dam, instead of the framing shown in the drawing, in order to keep down that part of the foundation. Since in creeks liable to heavy freshets, and where the water sometimes *backs up* below the dam to a considerable height, the whole structure being timber, becomes so buoyant that it is in danger of floating away, hence the object of the piling was more to prevent the foundation from rising than to support the weight of the superstructure, which object would of course be effected by the addition of sufficient stone as before stated.

The following is the estimate of material for the Dam and Bridge:—

Round piles of hardwood 12 inches diameter, lineal feet,	1680
Square do. pinewood 12 do. do. do.	560
3 inch sheet piling, board measure, superficial feet, - -	5250
Oak and elm squared timber, cubic feet, - - - - -	3500
Pine do. do. do. do. - - - - - - -	3450
3 inch pine plank, board measure, superficial feet - -	42300
5 inch oak and elm do. do. - - -	12000
Wrought iron, in lbs., - - - - - - - - - - -	1740
Wrought spikes, in lbs., - - - - - - - - - - -	500

Applications of Centrifugal Action to Manfacturing purposes.—It is well known that a centrifugal machine has been hitherto employed with much advantage for the drying of textile fabrics and for clarifying sugar; but these are not the only purposes to which it is adapted; for every day new applications of this apparatus suggest themselves, and important problems are solved by its means. We now learn that one of the most important operations of brewing may be wonderfully simplified by the use of a centrifugal apparatus. It has been hitherto considered extremely difficult to reduce the temperature of beer to the degree of coolness requisite; it has been necessary to make use of refrigerators for this purpose, and, notwithstanding all precautions, mistakes not unfrequently happen. It occurred to some English brewers that this difficult cooling process might be effected by means of a centrifugal machine. This idea has been put in practice with complete success. The beer was reduced to the desired temperature by merely passing it through the machine; and this was effected not only with great rapidity, but also with considerable economy. Some time back, M. Touche, of Paris, endeavoured to produce ice by means of a hydrofugal apparatus. He did not succeed in reducing water to the freezing point, but he cooled it to a degree far below that required in brewing beer. It would be superfluous to explain these results, for every one is acquainted with the effects of a very rapid ventilation, and the centrifugal machines are made to rotate at the rate of 3000 revolutions per minute, and even quicker. We are further informed that in certain manufactories in Alsace a hydrofugal machine is used for making starch. When the flour is stirred about in water, the different substances range themselves according to their specific gravities, unless prevented by some peculiar circumstances. Now, this is precisely the result obtained by the centrifugal machine; starch, being the heaviest substance, separates itself from the others, and is first precipitated. The centrifugal machine may also be advantageously applied for classifying grain, seed or ores, according to their respective densities, whether liquid or solid, provided they are not of a cohesive nature, or that whatever cohesiveness they possess may be easily removed. In fact, the centrifugal apparatus may be applied to so many different manufactures, that it may be justly looked upon as one of the most fortunate and fruitful inventions of modern times.—*Moniteur Industriel.*

Syphon Filter.—The Syphon Filter is, perhaps, the most convenient kind for general purposes, as it may be readily carried about and used by any ordinarily available pressure. The shape of the filter is that of an elongated bell. It is made of white metal; and, at the top of the bell-shaped vase, there is inserted an inflexible metal tube, furnished with a stop-cock near the end. The vase is filled with powdered quartz, of various degrees of fineness, and the mouth of it is closed with a perforated cover. When required to be used, the vase is inverted in the water to be filtered, and the tube is allowed to hang below it. When the air

is withdrawn, the water rises through the powdered quartz, and fills the tube; and, by syphonic action, the water is drawn down by its superior gravity. The lower the tube the greater the pressure, for the weight of water flowing down operates on the filtering surface as directly as if the same column of fluid were placed above it. The amount of pressure is, however, limited to that of the pressure of the atmosphere; for were the tube lengthened beyond 30 feet, the column of water would separate and leave a vacum. This filter renders the muddiest water beautifully clear when acting with the pressure of not more than two feet, at the rate of four gallons an hour.—*Report on the Great Exhibition.*

Rodd's Registered Filter-tap.

Fig. 1 is an outside view of Mr. Rodd's filter, and fig. 2 is a section, about quarter size. It is of brass, tinned inside, to prevent the slightest contamination of the water; and is composed of three cylinders, the second one having a series of small holes, drilled laterally near the bottom, through which the water enters the filter, which may be attached directly to the cistern or butt. The course of the water is shown by the arrows. The filter is filled with peat charcoal, or other approved material. When the filthy stuff supplied by the water companies is passed thro' one of these filters, it will pass out not only mechanically, but chemically purified, from the deodorizing and purifying power of the peat charcoal, as we have on previous occasions amply shown.

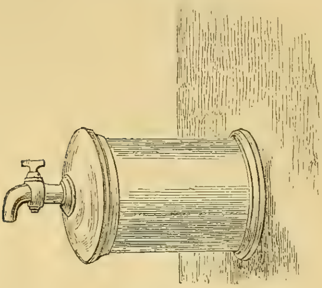


Fig. 1.

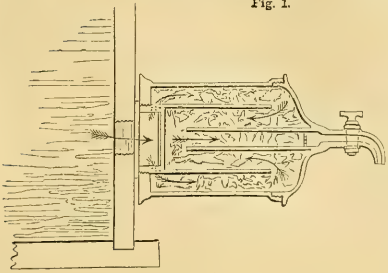


Fig. 2.

St. Rollox Chemical Works.—The chimney of the St. Rollox Chemical Works is the highest building in the city, and the highest of its kind in the world. Its height is 455 feet from the foundation, 435 feet from the surface of the earth, and, from the position, it must be nearly 600 feet above the level of the sea. Its diameter at the surface of the earth is 40 feet; but it tapers upwards until, at the top, the breadth is reduced to 13½ feet. This is the measurement within the walls; but, for nearly 200 feet upwards, the building is double. One chimney is built round another until the fabric reaches nearly the height mentioned. The erection occupied the greater part of two summers, andwas completed at a cost of £12,000. The St. Rollox works form a vast chemical laboratory, covering twenty acres of land.—*Atheneum.*

Agricultural Engineering.

The farm of Harold Littledale, Esq., of the County of Chester, England, furnishes an illustration of the very artificial practice now becoming by no means uncommon among the scientific Agriculturists of the day. The experiment so thoroughly and successfully carried out by Mr. Littledale, derives additional interest and importance when contemplated with regard to the proposed distribution of the sewage water of London and some of the large provincial towns, over the farms in the vicinity of those great centres of population. Canadian Farmers are not in a position to avail themselves of the expensive artifices described below. Such examples, however, serve well to encourage the enterprising in this country, to seize upon every rational means of raising the standard of Husbandry, and to arrive at that practice which secures the greatest amount of permanent remuneration with comparatively, the least expenditure of capital. The details subjoined we extracted from the report to the Board of Health on Liscard Farm near Birkenhead, by W. Lee, Esq., Superintending Inspector.

Mr. Littledale has drained all the land on this farm capable of being drained. Both pipes and tiles have been used. Some of the drains are laid only 2½ feet deep, others 4 feet, and latterly, increased as the result of experience. The average width between the drains is about 21 feet. The cost was £4 to £5 sterling per acre.

Liquid manure is preserved for distribution in a tank capable of containing 58,300 gallons. It is forced by means of steam power through iron pipes through a distance of 2 miles, serving for 150 acres. There is a hydrant for every 300 yards of main. The hydrants are so fixed that with 150 yards of hose the distributor and boy can irrigate 10 acres per day. The quantity distributed to each acre being about 4,118 gallons.

The hose pipe is of gutta percha, and consists of 75 yards, 2 inches in diameter, costing 2s. 6d. per yard, and 75 yards 1½ inch.

Mr. Littledale's capital account for irrigation stand thus :—

	£	s.	d.
Tank - - - -	£210	0	0
Steam Engine - - -	60	0	0
Two Pumps - - -	70	0	0
Iron Pipes - - -	315	0	4
75 yards of 2-inch gutta percha hose	9	18	0
75 yards of 1½ do do	7	10	6
Total - - -	£672	1	10

From the data already ascertained the following will be the annual account for interest and working expenses.

	£	s.	d.
Interest upon £672 and wear and tear @ 7½ per cent. - - -	£ 50	8	0
Fuel due to irrigation - -	4	6	8
Wages - - -	13	4	4
	£67	19	0

Divided by 150, the number of acres irrigated, the account is equal to an average of 9s. 0¾d, per acre.

The present live stock yielding manure consists of 81 milk cows, 2 bulls, nearly 100 pigs, and 12 horses. All the liquid from the stables, cow-houses, piggeries, yards, cottages, and the bailiff's house, drains underground to the tank.

As the general result of draining, liquid manures, and other improvements effected by Mr. Littledale, I (Mr. Lee) was informed that the yield of the whole farm is double what it was 10 years ago.

The liquid manure has been hitherto applied to nothing but grass. It is intended now, however, to apply it to crops.

My informant said—

"We have now 80 acres of Italian rye grass, and look to it first for food for the cows. We buy nothing for the cattle but malt grains, the annual account for which is about £130. We sell a portion of the turnips at times, but shall have none to spare this year. We also sell some potatoes and straw, but generally the crops are consumed on the farm."

The Italian rye grass has had none but liquid manure, and has been cut three or four times during the summer and autumn. The crops averaged from 2½ feet to 3 feet thick each cutting. The fourth crop from one piece was weighed, and produced 10 tons per acre.

That was the least of the crops from the same land, but the whole produce of that piece was above the average.

Many calves are sold, but the value of the young stock is low in the market, and I could not ascertain the sum realised.

From 50 to 60 pigs are killed per annum. Some few are sold as pork but the greater part is made into bacon. The average weight is about 20 stones each, and the bacon sells wholesale at 7*d.*, and the hams at 9*d.* per pound.

Two hundred gallons of milk per day, on the average, are sold to New Brighton and Seacombe, at 1*s.* per gallon.

The butter averages 180 lbs. per week, at 1*s.* 2*d.* per pound.

Taking the bacon and hams at 7½*d.* per lb., on the average, the annual produce of the farm in those three items alone is as follows:—

	£	*s.*	*d.*
Bacon - -	481	5	0
Milk - -	3,650	0	0
Butter - -	546	0	0
	£4,677	5	0

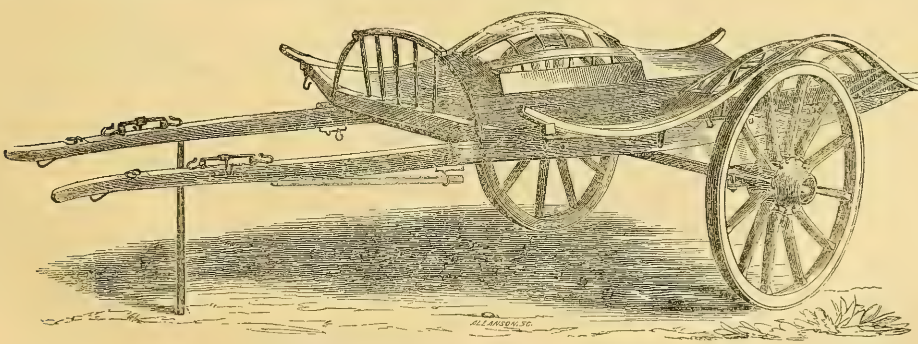
Steam Plough.—The first public trial of Usher's steam-plough took place at Baugholm, near Edinburgh, on the 14th of November last, when only four ploughs were used, although the locomotive is adapted for six. The amount of power that may be introduced is, of course, indefinite; and the machine might be made capable of working a series of ploughs to compass any proportionate breadth of land. The ploughshare penetrated deeper than is reached by the horse-plough, and the loam was thrown up and pulverised as loosely as if the spade had been at work. The field was level, and the operation was viewed with great interest by the spectators. A second trial took place on the same farm on the 21st of November, with similar results. Practical men present expressed their surprise at the superior manner in which the soil was stirred. Another trial took place on Friday, the 27th of February; the plough traversed the field six times with perfect success, and, as on the first occasion at Bangholm, to show its capability to travel over a soft surface, it ploughed a part of the land twice over. This experiment was supplementary to one which had taken place on the previous day, in presence of the committee of the Highland Society.

The cost of the machine is about £300, and it is adapted to ploughing, thrashing, rolling, and harrowing. It travels 2550 yards per hour, turning over 50 inches in breadth, which is equal to 7 acres in 10 hours, at a daily expense of 17s. or 18s., which is about 2s. 6d. per acre, while it costs 9s. or 10s. to plough an acre with horses. Although the first machine may not be perfect, still the fact is undeniable that the great obstacle to ploughing by steam has been got over, and with a little improvement the inventor has no doubt of making the machine perfect.

The cost of the steam-plough per day is estimated as follows:—

12 cwt. coals - - -	6s.	0d.
Engineer - - -	3s.	6d.
Two laborers - - -	4s.	0d.
Horse, two hours - - -	1s.	6d.
Interest on machine and repairs -	2s.	6d.
	17s.	6d.

Farm Machinery.—The portable farming produce mill, from Mr. Crosskill, of Beverley, has been tried at Canterbury, in the presence of many of the leading agriculturists in the neighbourhood. The experiment was very satisfactory; it ground oats and beans, and, to show what it was capable of doing, flint stones were ground to fine powder, by putting different kinds of grinding plates in, an operation which was attested in 15 minutes; and from which, it appears, any substance can be ground, from flint stones to barley meal. The mill was driven by the portable steam-engine belonging to Mr. Neame, of Selling, who, we are informed, has purchased the mill. At a private trial at Mr. Neame's farm, at Selling, the mill crushed oats at the rate of 30 bushels per hour, and split beans at the rate of 60 bushels per hour, and ground barley to fine meal at the rate of 8 bushels per hour, besides grinding bones, and crushing flint stones, bricks, &c.



Ransome and May's One-Horse Harvest Cart.

This cart is very useful and well adapted for carrying large loads from the harvest fields. It is made very light in weight, and, from the best materials being used, and good workmanship is strong. It may be more readily loaded than the waggons in

ordinary use. It is manufactured by Messrs. Ransome & May, of Ipswich, who obtained the gold medal of the Royal Agricultural Society of England at the general meeting at Oxford, and a second time at Derby. The price of the cart is not necessarily much higher than those of the older and less efficient vehicles. Flat carts were used in many parts of the country for the harvest home, but they obviously incurred more or less damage to the crop. Frames projecting at an angle from the body of the cart were subsequently employed to accomplish one of the objects obtained by Messrs. Ransome & May's cart; which secures not only great width in loading, but a perfect guard to the wheels. In the present state of agricultural affairs, small savings are of great importance to farmers, who may soon economise the cost of a cart in the saving of labour and time, and the safety to crops obtained in conveying them by proper vehicles from the field to the farmyard.

CORRESPONDENCE.

For many years the people of Canada have had just cause to regret, that information respecting the resources of the vast territory they possess, should have had such a limited circulation in the Mother Country. It is needless now to enquire into the minor causes of the extraordinary ignorance which but too generally prevails in England of the progress of the Canadas, and of the admirable opportunities they offer for the safe and remunerative investment of capital, or the exercise of well-applied industry. We are willing to rest satisfied with the explanation, which at the first blush suggests itself, that the commercial and industrial classes at home are so completely engaged with their present relations, that without their attention is pointedly drawn to a new field for enterprize, by authority upon which they can rely with confidence, they do not care to embark in projects which appear doubtful or visionary, through ignorance of the circumstances under which they are to be pursued.

It is with peculiar pleasure that we have now the opportunity of calling the attention of the Canadian public to the proposition of the Society of Arts, embraced in the subjoined correspondence. We are there told that "the correspondence which has taken place with the Colonies, on account of the Exhibition, has brought to notice that those by whom it has been conducted are capable of affording a vast amount of information, which only requires to be collected and printed to make it of great use to this country." We are further informed, that among the principal objects which the Council of the Society of Arts have in view in establishing the Colonial Committee, are,—

1st. To make known to the mercantile and general public of Great Britain and Ireland, the principal products of each of the Colonies, and the facilities for obtaining them.

2nd. To point out to the Colonists any of those products which may be advantageously imported into England.

3rd. To afford such information as any Colony may require in regard to Implements, Machinery, Chemical or other processes necessary to the prosecution of its special branches of industry.

It is almost unnecessary for us to urge upon our fellow-countrymen the importance of availing themselves to the uttermost, of the opportunities presented by the Society of Arts, through whose agency the British people may be made acquainted, not only with our progress in the Industrial Arts, but more especially with the nature and extent of those vacant and neglected fields of enterprize in which this country abounds.

Correspondence relative to the establishment of Communication between the Society of Arts, Manufactures and Commerce (of London,) and the Canadian Institute, with a view to advancing the knowledge of the resources and capabilities of Canada abroad, and of promoting information on the same subject within the Province.

GOVERNMENT HOUSE,
QUEBEC, 17th July, 1852.

SIR,—

I am directed by the Governor General to transmit to you as Corresponding Secretary of the Canadian Institute, the enclosed copy of a letter from the Secretary to the Society of Arts, Manufactures and Commerce, to Her Majesty's Principal Secretary of State for the Colonies, with enclosures having reference to the establishment of a Correspondence between the Society of Arts, and similar institutions in the Colonies. His Excellency is desirous to ascertain, through you, whether the Canadian Institute will be disposed to engage in the proposed Correspondence with the Society of Arts, as he believes that the objects of the Institute and the interests of the Province would be promoted thereby.

I have the honor to be, Sir,

Your most obedient humble Servant,

R. BRUCE,
Gov. Secretary.

F. CUMBERLAND, Esq.,
Corresponding Secretary,
Canadian Institute.

Copy of a Letter from the Secretary to the Society of Arts, Manufactures and Commerce, to Her Majesty's Principal Secretary of State for the Colonies.

Society of Arts, John Street Adelphi, London,
26th March, 1852.

SIR,—

I am directed by the Council of the Society of Arts to acquaint you, that they have appointed a Committee of the following Members of the Society, viz :—

The Earl Grey	Joseph Glynn, Esq. F. R. S.
Robert Stephenson, Esq. M. P.	Wyndham Harding, Esq.
Dr. J. F. Royle, F. R. S.	Nathaniel Lindley, Esq.
Professor Solly, F. R. S.	Alfred Reade, Esq.
John Bell, Esq.	Lieut. Tyler, Royal Engineers.
C. Wentworth Dilke, Esq.	

to consider the best means of making the Society useful in advancing the knowledge of the resources and capabilities of the numerous British Colonies in all quarters of the world, and in furnishing the Colonies themselves with such information as may be required on subjects connected with Arts, Manufactures and Commerce.

The accompanying Enclosures, Nos. 1 and 2, will explain the Constitution of the Society, the objects they have in view in adopting the present measure, and the means which they possess of carrying them into effect.

The Council conceive that one of the first steps towards the attainment of their Objects, will be the establishment of a Correspondence with similar Institutions in the Colonies; or, in the smaller Colonies, where no such Institutions exist, with a Committee consisting of three or more Members, in all cases where volunteers for such a purpose can be found.

I am therefore, to express the hope of the Council, that you will be pleased to accord to the Society the advantages of that co-operation and assistance which the Colonial Office is so well able to afford, to enable them to place themselves thus in correspondence with the

numerous Colonies. And, as the readiest means of doing so, I am directed to transmit to you Printed Copies of the present Letter and its Enclosures, which the Council trusts you will have the goodness to forward to the Governors of Colonies, with such instructions for their judicious distribution as may appear best calculated to ensure their practical utility.

I have the honor to be, Sir,

Your most obedient Servant,

GEORGE GROVE,

Secretary.

ENCLOSURE No. 1.

Brief Statement of the Objects, Government, Revenue and mode of Action of the Society for the Encouragement of Arts, Manufactures, and Commerce :

Objects:—The Society for the encouragement of Arts, Manufactures and Commerce was founded in 1754, and incorporated under the above name by Royal Charter in 1847, they are summed up in the Charter as —"Generally to assist in the advancement, development and practical application of Science in connection with the Arts, Manufactures and Commerce of the Country."

Government:—It is governed by a President, Vice-Presidents, two Treasurers, two Auditors, and from twelve to twenty-four other Members, who form a Council elected annually by ballot at a General Meeting of the Society. The Secretary and Collector are elected in a similar manner, and are the only officers who receive any salary. The following are the Officers for the present year :—

PRESIDENT.—His Royal Highness Prince Albert. VICE-PRESIDENTS.—The Duke of Buccleuch, The Earl of Carlisle, The Earl of Ellesmere, The Earl Granville, The Lord Colborne, The Lord Overstone, Sir J. P. Boileau, Bart., Right Hon. E. Strutt, M. P., Right Hon. T. Milner Gibson, M. P., H. T. Hope, M. P., George Moffatt, M. P., S. M. Peto, M. P., Robert Stephenson. M. P., Beriah Botfield, Sir C. Barry, R. A., I. K. Brunel, F. R. S., Thomas Creswick, R. A., W. F. Cooke, Chas. Dickens, C. Wentworth Dilke, M. Faraday, F. R. S., Owen Jones, J. M. Rendel, Pres. Inst. C. Engrs., W. Tooke, F. R. S.

COUNCIL.—John Bell, Thomas Cubitt, Joseph Glynn, F. R. S., W. Harding, C. E., Professor T. H. Henry, F. R. S., Capt. Henry C. Owen, R. E., Dr. Lyon Playfair, C. B., J. Scott Russell, F. R. S., W. W. Saunders, Sydney Smirke, R. A., Professor Edward Solly, F. R. S., Thomas Twining, jun.

TREASURERS.—P. Le Neve Foster, M. A., Henry Cole, C. B.

AUDITORS.—Thomas Winkworth, Samuel Rengrave.

SECRETARY.—George Grove.

Revenue:—The Society consists at present of 1200 Members, and its revenue is about £2000 a year,—mainly derived from their individual contributions.

Mode of Action:—The Council appoint annually Standing Committees to report upon the various Departments of the Arts and Manufactures, and has lately adopted for this purpose the Classification of the late Exhibition, the Committees being thirty in number, to correspond with the thirty Classes.

These various Committees examine and report on the merits of all useful inventions and discoveries, which are publicly exhibited at certain periods by the Society. And upon the reports of the Committees the Council award Medals and other rewards for inventions, treatises, or other objects calculated to advance the interests of the Arts, Manufactures and Commerce.

The Society by these means has been the first and principal medium for introducing to public notice the principal discoveries in Arts and Manufactures which have been brought to light during the present century in this country.

The Council further appoint from time to time Committees for various Special purposes; among others may be named that for Elementary Drawing Schools, and those for Foreign, Colonial, and Provincial Correspondence.

ENCLOSURE No. 2.

The principal objects which the Council have in view in establishing the Colonial Committee may be generally enumerated under the following heads :—

1. To make known to the Mercantile and general Public of this Country the principal products of each of the Colonies, and the facilities for obtaining them.

2. To point out to the Colonists any of those Products which may be advantageously imported into England.

3. To afford such information as any Colony may require in regard to Implements, Machinery, Chemical or other processes necessary to the prosecution of its special branches of Industry.

4. To exhibit and make known to the British Public, Inventions which Colonists have otherwise great difficulty in introducing into notice, that being one of the principal branches of the Society's operations.

5. To collect for the Thirty Standing Committees, information relative to the various departments of Trade in the Colonies.

6. To make a comparison of Coins, Weights and Measures, as used in the Colonies, and to receive and discuss propositions for giving them uniformity.

7. To investigate and report upon the operations of the Patent Laws in the Colonies.

It is hoped that the periodical transmission of the printed Proceedings of the Society of Arts may often convey valuable information to distant Colonies, and the Society hope to enrich their own Annual Volume by communications from kindred Associations, and from Individuals in the Colonies.

The Council feel confident that these measures cannot fail to be of use both to the Mother Country and to the Colonies, and that should they be unsuccessful in some of the objects above enumerated, benefit will ensue from the remainder.

It may be desirable here to state the reasons which induce the Council to originate the present scheme.

It was as President to the Society of Arts, that His Royal Highness Prince Albert first announced to the World the project of the Exhibition of 1851. The Society had a considerable share in the early progress of the Exhibition, and counts amongst its Members a large proportion of those who took an active part in that great Work.

The Society also contains many Members eminent in the several branches of science, and influential in the Country, and consequently the Society possesses the means of making extensively known, amongst the Manufacturers and Public of Great Britain, any new or important products which may be made available in the Arts, Commerce, or Manufactures of the Country. As a recent instance of this nature, it may be mentioned that Gutta Percha and its valuable properties were made known through the exertions of the Society.

The Correspondence that has taken place with the Colonies, on account of the Exhibition, has brought to notice that those by whom it has been conducted are capable of affording a vast amount of information, which only requires to be collected and printed, to make it of great use to this Country. And the anxiety which has been evinced for such information as, it is hoped, may be advantageously furnished by Members of the Society, has directed attention to the fact that they have now no direct means of obtaining such information. The Society feels confident, that those who took an active part in the promotion of the Exhibition, will be the first to come forward and render assistance to any scheme such as the present, by which efforts are made to perpetuate its results.

It may be interesting also here to refer to a few of the advantages which have been actually derived from the display of Colonial Produce at the Great Exhibition.

Isinglass had hitherto been regarded as obtainable principally from the fish of the Russian rivers. But it has been ascertained that the rivers of Canada abound with fish producing Isinglass of the first quality, and that a new industrial occupation is thus open to the Canadians, whilst a supply of Isinglass can be furnished to this country at a much more reasonable price than hitherto.

Another remarkable instance is the discovery that Corundum, which has served many of the purposes of diamond and emery powder in India for a long period, might also be brought into use in this country; a mineral with which it is believed but a very small portion of the British public had hitherto been acquainted, and which it is suspected has in some instances been sold to our large firms under the name of Diamond powder.

Amongst the substances from the Colonies which have been brought into notice, may be also mentioned walrus skin, porpoise leather from the St. Lawrence, the resins and fatty substances and vegetable waxes from Australia, all of which appear likely to excite attention in the commercial world.

Notwithstanding that these and other substances have been brought into notice, Colonial Produce was on the whole but indifferently represented in the Exhibition, and the Council confidently hope that the means they have now adopted may lead to the formation, at some future period, of a permanent Exhibition of Colonial Produce, either separately, or what would perhaps be preferable, as part of The Collection arising out of the Great Exhibition, from the exertions of The Royal Commissioners.

(Signed) GEORGE GROVE,

Secretary Society of Arts.

CANADIAN INSTITUTE,
TORONTO, 31st July, 1852.

SIR,—

I have the honor to acknowledge the receipt of your Letter of the 17th instant, with enclosures transmitted by command of His

Excellency the Governor General, having reference to the establishment of a Correspondence between the Society of Arts and the Canadian Institute, for certain purposes connected with Arts, Manufactures and Commerce, therein set forth, and in reply to inform you, that having submitted the same to the Council of the Canadian Institute, I am directed to request that you will assure His Excellency that the Council will gladly take every means in its power of promoting the intentions of the Society of Arts; that it will be happy to receive any communications and act upon the suggestions of that Society; and is prepared to become the medium of transmission to it of information relative to the productions and resources of Canada; of the inventions of persons resident in the Province, together with whatever else of local interest may appear to fall within the scope of its enquiries, or be deserving of its notice.

I am further directed to transmit for the information of the Society of Arts, a Copy of a Charter of Incorporation of the Canadian Institute, of its By-laws, and of a Circular of Enquiry lately issued under the authority of the Council, by which it will appear that the Institute is already in some degree engaged in the pursuit of those objects which the Society of Arts contemplates, and the attainment of which the co-operation and support of that Society will most powerfully and opportunely advance.

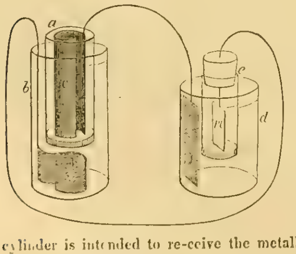
I have the honor to be, Sir,
Your most obedient humble Servant,
FRED. CUMBERLAND,
Corresponding Secretary.

THE HON. R. BRUCE,
Governor's Secretary,
Quebec.

SCIENTIFIC INTELLIGENCE.

Chemistry and Physics.

Golding Bird's battery and decomposing cell.—This apparatus which can be constructed in half an hour at a very trifling expense, is exceedingly interesting as affording a constant current for a long period of time and effecting decompositions which batteries of the ordinary form and of considerable magnitude often fail in producing. The battery consists of an outer jar (b) of glass 8 inches deep by 2 inches in diameter, the inner cylinder (a) is four inches long and 1½ in diameter, closed at one end by a plug of plaster of Paris seven tenths of an inch thick, and fastened into the outer jar by means of pieces of cork. Into the inner cylinder is placed a slip of sheet copper (c) 4 inches by 3 with an attached conducting wire also of copper. In the outer jar, below the inner cylinder is placed a coil of sheet zinc furnished with a conducting wire. The inner cylinder is filled with a saturated solution of sulphate of copper, the outer jar with a weak solution of common salt, both fluids standing at the same level. After some weeks beautiful crystals of metallic copper, red suboxide, and of sulphate of soda are found adhering to the copper plate in the inner cylinder.



The decomposing cell is the counterpart of the battery itself, the inner cylinder (e) being about ½ inch wide and 3 inches long and furnished with a platinum plate (pl,) the outer cylinder (d) is filled with a weak solution of common salt and contains an amalgamated zinc plate (z.) The connections will be seen from the engraving; the inner cylinder is intended to re-ceive the metallic or other solution which is to be decomposed, and the battery and cell form together an arrangement of two active cells with four elements. When the inner cylinder of the decomposing cell is filled with solutions of the nitrates of iron, copper, tin, zinc, bismuth, antimony, lead or silver, the metals are deposited on the platinum frequently in a crystalline form. This is especially the case with copper and silver. An alcoholic solution of fluoride of silicon gives in 24 hours a black deposit of free silicon exhibiting a tendency to crystalize. An aqueous solution of the same gives rise to the formation of minute crystals of quartz sufficiently hard to scratch glass.

By a slight modification of the apparatus, Dr. Bird succeeded in effecting the decomposition of the bichlorides of potassium and ammonium. A funnel is substituted for the inner cylinder in the decomposing cell, the bottom is closed by plaster or stucco, and a piece of test tube containing mercury is put in the place of the platinum plate (pl,) being connected with the conducting wire by means of a spiral wire of platinum. With such an arrangement it is only requisite to leave the battery in action for a few hours to obtain in the one case the amalgam of potassium, in the other the bulky compound of mercury and ammonium.

Use of Oxide of Zinc as a Pigment.—The poisonous nature of the carbonate of lead, or white lead, renders the manufacture of this most valuable pigment exceedingly injurious and often fatal to the workmen, and it has long been wished that some innocuous compound might be discovered which could be substituted for it. The peculiar property which renders the carbonate of lead so valuable, is what is tecnically called its "body," viz., the power of completely covering and concealing any other even dark color, when applied in a thin coating after having been rubbed up with oil. Many other substances might be applied as a white paint if they possessed this property, but as yet all but the oxide of zinc have been found deficient, for instance the sulphate of Baryta (Heavy Spar) which is found in large quantities as a mineral and in a state of great purity, is sometimes sold instead of white lead, for which it might easily be mistaken on account of its high specific gravity, it possesses however no body. The carbonate of zinc obtained by precipitation is equally useless from the same cause, but it has been found that the oxide produced by the combustion or oxidation either of metallic zinc or of some of its ores, can be employed with advantage.

The manufacture of this substance as a pigment is now carried on to a considerable extent on this continent by the New Jersey Zinc Company, the quantity produced daily amounting to 5000 pounds. (Silliman's Journal, May 1852.)

The ovens are of brick and very low, but of large superficial area, they are heated both above and below by anthracite fire. Each oven is charged with 1000 pounds of the crushed ore, (Red Zinc and Franklinite) mixed with an equal bulk of anthracite coal dust. A current of atmospheric air is established by pipes of iron proceeding from each oven to a large tube, in which a stream of air is kept moving by means of a fan wheel. The carbon of the anthracite reddens the ores and forms metallic zinc which, however, is immediately burnt by the oxygen of the air and produces the oxide; that is carried off by the current through long tubes into sacks of closely woven muslin out of which it is from time to time removed into casks. The oxide is never perfectly pure, from small particles of dust being carried along with it.

Although oxide of zinc is decidedly preferable to carbonate of lead on account of its salubrity, yet it does not appear that it is entirely free from all poisonous properties, for several cases of severe colic have been observed, evidently resulting from exposure to its influence. One case was that of a man employed in putting the oxide into barrels, who was effected with all the symptoms of violent colic. Other instances were observed among workmen employed in cutting and twisting the wires used for securing champagne casks. Formerly common iron wire was employed, but in 1850 galvanized iron was substituted, (i. e. wire covered with zinc). The wire was covered with a white dust containing oxide and carbonate of zinc but no lead. In a few days they were all affected with colic. On working with some wire freed from this adhering dust, no ill effects were observed.

Magnetic Science yet in its infancy.—An important discovery, it is said, has been made by Mr. George Little, the electrical engineer, in which continuous streams of electricity can be produced from single magnets, and be made to decompose water, precipitate metals from solution, produce constant power in electro-magnets, and work the chemical printing and double-needle telegraph. Magnetic science is but in its infancy, and we should not be surprised, as before said, to find it evolve almost magical results. Dr. Faraday lately showed the possibility of literally collecting the terrestrial magnetism, and accumulating its force in apparatus used for the purpose. This he showed could be done by revolving a wheel in a certain direction, cutting the lines of magnetic force, or winding them up as it were on the disc or wheel while placed in the proper direction, and not in any other. Here is something that almost looks like that reality of which the circling manœuvres of the magician's wand were but a superstitious and vain foreshadowing!

Lightning Conduction.—A discovery akin to that of Mr. G. Little—lately noticed in our columns—is said to have been made by Mr. Roger Brown, of Sheffield; namely, that magnetised steel has pre-eminent power to attract the lightning when used in conductors instead of the ordinary article. By this means, and by multiplying the number of points in the head of the conductor, its attractive power is said to be tripled in intensity, its influence extending to some distance round the spot where it is fixed.—*Builder.*

New Application of the Water Gas.—Mr. Samuel Cunliffe Lister, of Bradford, has most successfully applied Mr. White's patent water gas—obtained by decomposing water on incandescent charcoal or coke—to the heating of his machines for preparing and combing wool, in place of using fire from charcoal, as is the general practice in Yorkshire. This must be a very great improvement indeed, avoiding all dust and filth at present so troublesome from the use of charcoal, and avoiding the very deleterious influence of generating such a mass of carbonic acid, so perilous to the workpeople, and from which so many of them suffer severely. A gentleman who went last week to Addingham Mill to see this gas in operation, as applied to the heating of the combs, speaks most decidedly in its favor; and Mr. Lister so highly approves it, after a full trial, that he is about erecting it at several of his other establishments for the same purpose. It is stated to be very easily and very rapidly made, one retort of six feet long making 200 to 300 feet an hour, and at a trifling expense, while the intensity of the heat given out is certainly double that of ordinary gas. A piece of iron or copper wire held to the jet is almost instantly ignited, while the gas is so pure as in no way to injure the finest machinery with which it comes in contact. We cannot doubt but an improvement so decided must make rapid way in Yorkshire. The same gas for all purposes of singeing is stated as far superior to coal or cannel gas, and never fills up the small apertures of the singeing machines. Messrs. Gardiner and Bazley, of Dean Mills, Bolton, are using it extensively for singeing their yarns.—*Leeds Mercury.*

Ozone.—In a Lecture lately delivered by the Rev. Mr. Sidney at the Royal Institution, the Rev. gentleman announced his belief in the existence, diffused through plants, of that wonderful condition of oxygen gas called ozone, and which recently has attracted so much attention, not only in the scientific but in the manufacturing world, inasmuch as there now appears some probability of its becoming applied as a bleaching agent, instead of chlorine.

New Voltaic Battery.—A party of scientific gentlemen were recently invited by Mr. Martyn Roberts to witness a voltaic battery of new construction, professedly of great economy, which he has at present in action in the neighborhood of Great Portland Street. The battery consisted of fifty plates of tin, about 6 inches by 4,—each plate being adjusted between two plates of platinum of the same size. These were placed in stoneware cells about two feet deep, which were filled with diluted nitric acid. The object of these deep cells was, to obtain a marketable product which should be sufficiently valuable to cover the cost of the agents employed to effect the development of electricity. The upper stratum of nitric acid acts on the tin, and forms with that metal an oxide, which falls off from the plate the moment it is formed, and is precipitated as an hydrated oxide of tin to the bottom of the cell. The oxide is combined with soda; and as stannate of soda is extensively employed in dying and calico-printing, it is stated that this product will yield a profit of 20 per cent, on the cost of the battery by which it is produced;—but this is a point which we are not at present in a position to determine. The electrical action of the fifty pairs of plates was considerable. The current was employed to exhibit the electrical light,—and the effects produced were certainly very brilliant. It was not possible to compare it with the result obtained from a Grove's battery, but we judge their powers to be nearly equal. An experiment made on the decomposition of water gave about 7 cubic inches of the mixed gases, oxygen and hydrogen, per minute. We cannot but regard this very ingenious arrangement as an improvement on the ordinary batteries, as far as economy is concerned, where an electric current is required, since the stannate formed must always be of considerable commercial value. It is curious, too, that the stratum of fluid in the immediate neighborhood of the voltaic plates is kept uniformly of the same specific gravity, notwithstanding that the acid is rapidly removed. The oxide of tin formed takes down water with it, and at the same time establishes a current by which fresh acid is supplied to the plates.—We are informed that the battery continued in most uniform action for sixteen hours.—*Athenæum.*

Artificial Preparation of the Flavoring Matters of Fruits.—One of the most remarkable and interesting achievements of chemistry in the most recent times has been the preparation of certain liquids possessing the flavors of various fruits. So close indeed is the resemblance that we are almost warranted in supposing the flavor of the fruits to be actually caused by the presence of a trace of the above liquids. Several of these articles are employed in confectionary, and are manufactured on a tolerably large scale. The acetate of amylic oxide, when dissolved in six times its bulk of alcohol, emits a most powerful and agreeable odour of Jargonelle pears, and is used in flavoring *pear-drops.* The valerianate of amyle, dissolved in alcohol, gives the scent and flavor of apples. Butyric ether communicates the flavor of the pine-apple, and is used in the preparation of various beverages. Various other compounds of the so-called fatty acids, with the oxides of amyle and ethyle, possess very pleasing odours, and as they can be prepared at a reasonable price, may probably admit of extensive application in perfumery.

GEOLOGY.

Distribution of Gold.—Since the astounding discoveries in California and Australia, it has been clearly shown to the public, in numerous well-written articles in the daily journals, in periodicals and reviews, that though gold is the most universally distributed of the metals, with the exception of iron, yet that it only occurs, in quantities sufficient to be remunerative, in rocks of a certain antiquity, which have been crystalised by the action of intense subterranean heat. The rocks of North Devon are of this antiquity and character. Much popular error still prevails with regard to other laws which govern gold. It is generally believed that the same rule which regulates silver, iron, and other metals, applies to gold—namely, that the vein or lode increases in richness the deeper the mine descends. The converse of this is, in reality, the true geological principle, and gold decreases in value and yield as the vein or lode descends; the upper portion alone being prolific, and generally terminating in some baser metal. The only exception to the rule that we are aware of is that of the Morro Velho lode in Brazil, belonging to the St. John del Rey Company; but as it has been fairly remarked, if there be one admitted exception, another may exist; and, therefore, it may still be questioned whether the Britannia lode is within or without the accepted principle in geology, for the strong similarity of the Britannia and the Morro Velho lodes, in all their bearings, is undoubted.

There are two sources from which gold is derived: it is found in

alluvial deposits, formed from extensive abrasion of the rocks beneath the waters of past ages, or it is disseminated through the solid rock. Although, in some localities of North Devon, gold may be found in alluvial deposits, yet, in all probability, it is principally confined to the rock; and, owing to the prevailing error to which we have just alluded, it is believed by the unexperienced that much gold is only to be expected from very high mountains, and that it is, consequently, absurd to anticipate that the "mole hills" of Devonshire will compensate for the expense of working. This argument, however, is not sustained by general experience or actual facts. In the Ural, which is in the heart of a large continent, and, therefore, may be expected to reach a considerable height, some of the most prolific sources of the gold are at an elevation under 1000 feet above the level of the sea. Miask and Ekaterinburgh are each below that level, while Kyshluirsk is only 630 feet, and Bogoslovsk 500 feet. Although there are high points in the Ural, as well as in Australia and California, at which gold is found, yet the most productive localities in all these regions are of very moderate elevation. The gold district now revealed in Devonshire reaches an elevation of 700 feet above the sea. There is nothing valid, therefore, in the assertion of "mole-hills" being presumptive evidence of the non-existence of gold; and we do not hesitate to declare our firm conviction that a brief time will establish the Britannia gold-field as one of several localities among the hills of North Devon in which gold will repay the enterprise and industry of those who search for it.—*Mining Journal.*

Volcanic Eruption in the Sandwich Islands.—By an accurate measurement of the enormous jet of glowing lava where it first broke forth on the side of Mauna Loa, it was ascertained to be 500 feet high. This was upon the supposition that it was 30 miles distant. We are of the opinion that it was at a greater distance—say from 40 to 60 miles. With a glass the play of this jet at night was distinctly observed, and a more sublime sight can scarcely be imagined. A column of molten lava, glowing with the most intense heat, and projected into the air to a distance of 500 feet, was a sight so rare, and at the same time so awfully grand, as to excite the most lively feelings of awe and admiration, even when viewed at a distance of 40 or 50 miles. The diameter of this jet is supposed to be over 100 feet. In some places this river is a mile wide, and in others more contracted. At some points it has filled up ravines of 100, 200, and 300 feet in depth, and still it flowed on. It entered a heavy forest, and the giant growth of centuries was cut down before it like grass before the mower's scythe. No obstacle can arrest it in its descent to the sea. Mounds are covered over, ravines are filled up, forests are destroyed, and the habitations of man are consumed like flax in the furnace. Truly, "He toucheth the hills, and they smoke." We have not yet heard of any destruction of life from the eruption now in progress. A rumor has reached us that a small native village has been destroyed, but of this we have no authentic intelligence. Two vessels had sailed from Hilo, both filled to their utmost capacity with people who desired to witness this great eruption. The eruption seems to have broken out through an old fissure, about one-third down the side of Mauna Loa, on the north-west side, and not from the old crater on the summit, called Mocquoweoweo. The altitude of the present eruption is about 10,000 feet above the level of the sea, and from the bay of Hilo (Byron's Bay) must be some 50 or 60 miles. If it succeed in reaching the ocean at the point supposed, after having filled up all the ravines, gulches, and inequalities of a very broken country, it will undoubtedly be one of the most extensive eruptions of modern times. —*Polynesian.*

Iron.—In the recently discovered Iron Districts of Cleveland, Yorkshire, the beds are found to lie nearly level, varying in thickness from 12 feet to no less than 20 feet of ironstone, the most remarkable feature is that the ore is got by open quarrying; and is estimated that 10,000,000 tons may be got with the same facility. There is no limestone or coal in the district though geologists consider that they may yet be reached. The operations were commenced in April 1851 and the traffic of ironstone up the Stockton, Darlington Railway has since been at the rate of 200,000 tons per annum.

ZOOLOGY.

Infusoria the Larvæ of Intestinal Worms.—Among the most interesting of Agassiz's discoveries in embryology and the metamorphoses of the different lower orders of animals, the fact that Infusoria are nothing more than the Larvæ or young of Intestinal Worms, is perhaps one of the most important. Agassiz remarks that it is curious that the two types of the Animal Kingdom so long considered as the fundamental supporters of the theory of spontaneous generation should have finally been brought into such close connection, and that one of them —the Infusoria—should in the end turn out to be the earliest condition of the other—the intestinal worms being the parents of the Infusoria. The latter class may now be considered as entirely dissolved.—*Silliman's Journal, May,* 1852.

Artificial Breeding of Fish.—At a recent meeting of the Society of Arts, a paper was read by Mr. W. Boccius, "On the Artificial Breeding and Rearing of Fish, and the method to be adopted to preserve and improve the Fisheries of this country, and also of the colonies." Mr. Boccius commenced by calling attention to the decline which has taken place in all the fisheries of the United Kingdom, and proceeded to point out the means by which any sort of fish might be restored to a stream or river in one season, and the eggs transmitted from one part of the kingdom to another, or from one country to another, without the least injury to them. The main feature in artificial breeding was to have a pure spring of water, uncontaminated with vegetable or animal matter, at a temperature of 54° to 56°. At this warmth the salmon egg came into life in 100 days, trout in 50 days, and many other sort of fish in 42 days; but this was only the case when the water underwent no change of temperature. By the plan of artificial spawning which he proposed to adopt, the crossing of various breeds of fish of distant countries might be effected. Having found a pure spring of water, his method was to place boxes containing the spawn bed in the stream, in such a manner that there should be a constant flow of fresh water through the boxes. He next took two fish, and separated the spawn and the milt from them into a basin containing sufficient water to dilute the milt that might be absorbed by the egg. The eggs were then placed in the coarse clean gravel, three inches deep, and allowed to remain so until they were bred out. The brood was then left—of salmon, 30 days; of trout, 15 days—and afterwards put into a yearling stream, the small left to migrate, and the trout sent out into the main stream or river at the season following. If his system of artificial spawning were adopted, a vast amount of labour would be required, and a great additional quantity of food produced, while the gain to the proprietor of the water would be much increased. Supposing 300,000 eggs to be spawned, the produce of 12 salmon, of 25 lb. each, in two years these fish would give 3,000,000 lb. weight, and at that time they in turn would be capable of depositing the enormous quantity of three billions of eggs; and yet, with this great procreative power, the salmon and all other fish were fast decreasing in our rivers and streams. It was with a view to remedy this evil, that he desired to carry his plan into effect, and he had already adopted it successfully on the estates of the Duke of Rutland, the Duke of Devonshire, Earl Ducie, and many other persons of distinction and property in England. At the conclusion of the paper a vote of thanks was passed to Mr. Boccius, and after some little discussion the business of the evening terminated.

Naturalists will be pleased to learn, that in the course of the past month a young grass paroquet, of the Australian species, has been produced in the Zoological Gardens, Regent's Park; and also a pair of Mandarin ducks. One of the ostriches recently brought from Egypt, has, during the month, deposited four eggs, which have been placed in one of Cautelo's Hydro-Incubators. The result of the experiment is expected to be known in a few days, and is awaited with considerable interest.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—July, 1852.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario : 108 feet.

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M.	MEAN.	Temperature of the air. 6 A. M.	2 P. M.	10 P. M.	M'N.	Tension of Vapour. 6 A. M.	2 P. M.	10 P. M.	M'N	Humidity of Air. 6 A. M.	2 P. M.	10 P. M.	M'N	Wind. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.
						°	°	°													
c	1	29.573	29.503	29.430	29. 494	55.8	60.0	54.2	57.1	0.381	0.439	0.359	0.388	87	87	87	85	N b E	NE b N	N	0.590
c	2	.425	.455	.505	. 465	55 0	66.0	55 7	58.9	.350	.360	.256	.319	82	57	60	66	NW	W NW	W b S	- -
c	3	.565	.579	.606	. 583	51.0	70.6	55.6	59.2	.259	.417	.372	.345	70	58	86	70	W	W	Calm	- -
c	4	.664	.642			56.4	72.4			375	.490	. . .	. . .	84	63	. .	. .	Calm.	S	S	- -
d	5	.659	.651	.635	. 647	55 6	71.8	72.1	63.4	.396	.497	.416	.439	92	65	77	78	Calm.	E SE	Calm	Inap
c	6	.651	.654	.617	. 637	61.5	74.3	65.3	67.6	.445	.613	.506	.514	84	75	84	78	Calm.	Calm	Calm	0 200
e	7	.661	.638	.630	. 641	62 4	85.1	69 6	73.0	.492	.808	.612	.647	90	69	88	82	Calm.	Calm	Calm	- -
a	8	.655	.678	.555	. 591	69 3	84.4	71.4	75.9	.567	.798	.605	.666	81	69	81	76	Calm.	S SE	Calm	- -
d	9	.573	.636	.609	. 595	69.8	67.3	68 3	69 6	.589	.603	.641	.622	84	93	96	89	Calm.	S b W	Calm	0 960
e	10	.685	.693	.635	. 668	67.3	78.6	68 5	72.1	.496	.634	.535	.564	76	67	79	74	N b E	E b S	N NE	- -
c	11	.580	.460			67.0	80 8			.576	.752	. . .	. .	90	53	. .	. .	E b N	S SE	W by N	0.180
d	12	.839	.827	.733	. 791	58.1	67.5	58.6	62.5	.421	.457	.401	.425	90	71	83	78	W b S	SE b E	Calm	0.005
c	13	.619	.557	.558	. 580	61 4	66.2	65.0	63.6	.460	.516	.486	.498	87	87	81	86	E b N	E	N NW	0.130
d	14	.635	.654	.711	. 670	58 5	76 6	62.8	67.2	.437	.432	.408	.411	91	49	73	66	NW b W	NW b N	N b W	- -
d	15	.799	.827	.826	. 818	63.2	74.0	57.8	65 8	.429	.485	.336	.417	76	59	72	67	N	S b E	Calm	- -
—	16	.846	.793	.677	. 761	56.2	77.9	55.7	65 1	.365	.442	.361	.400	82	48	83	68	Calm.	S SE	E b N	- -
c	17	.618	.576	.603	. 597	60.4	76.1	68.6	69.3	.377	.500	.505	.477	73	57	74	68	N b E	S SE	N	- -
a	18	.746	.809			59.5	66.2			.329	.439	. . .	. .	65	71	. .	. .	NE b N	SE b S	Calm	- -
a	19	.902	.918	.854	. 885	52 3	68 9	56.1	61.1	.315	.362	.357	.357	81	53	81	69	Calm	E SE	E N E	- -
a	20	.864	.825	.749	. 808	54 8	78.8	65.9	69.1	.375	.574	.529	.506	90	61	85	75	Calm	S b E	S	- -
a	21	723	.642	.596	. 647	63 9	89.0	72 2	76.7	.521	.516	.497	.528	90	39	65	63	Calm	SW b W	Calm	- -
a	22	.608	.572	.589	. 584	70.8	82.9	66.9	71 9	.547	.629	.401	.488	75	57	62	58	Calm	S	NW b N	- -
b	23	.625	.626	.662	. 643	60.7	76.5	64.3	69 2	.403	.533	.454	.461	78	60	77	67	Calm	S SE	N	- -
b	24	.723	.699	.648	. 686	57.8	74 8	60.2	65.7	.348	.423	.411	.415	74	51	81	68	N b E	SE	Calm	- -
b	25	.609	.555			60 3	68.7			.426	.546	. . .	. .	83	81	. .	. .	Calm	Calm	Calm	0.100
b	26	.410	.477	.514	. 479	62 5	77.6	61.5	67.7	503	.456	.346	.433	91	49	65	67	Calm	N NW	N NW	- -
c	27	.598	.620	.686	. 636	56 9	76.5	56 4	63.0	.334	.483	.323	.372	74	54	73	66	NW b N	S b E	NE	- -
c	28	.701	.652	.508	. 608	53.1	76.1	62.3	66.9	.375	.466	.467	.447	79	53	85	71	Calm	SE b E	Calm	- -
d	29	.388	.275	.175	. 265	66.3	79.0	70.5	72.9	.544	.679	.264	.572	86	71	72	78	Calm	S	W NW	1.860
c	30	.139	.215	.332	. 244	64.6	72.9	61.4	66.3	.540	.413	.383	.418	91	52	72	66	SW b S	W b N	NW	- -
c	31	.409	.489	.560	. 493	54.3	63.6	50.9	56.5	.356	.323	.297	.329	86	57	81	75	Calm	W b N	Calm	- -
	M	29.626	29.616	29.600	29 6118	60.31	75.29	62 51	66.68	0.431	0.515	0 427	0.461	83	63	77	72	Ml's 1.68	Ml's 5.83	Ml's 1.84	4 025

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1063.59	977.60	554.28	505.17

Mean velocity of the wind - - 3.33 miles per hour.
Maximum velocity - - - - - 17.9 miles per hour, from 2 to 3 p.m. on 30th
Most windy day - - - - - 30th : Mean velocity, 10.16 miles per hour.
Least windy day - - - - - 25th : Mean velocity, 0.20 ditto.
Hour of greatest mean velocity - 3, p.m. Mean velocity, 5.84 ditto.
Hour of least - - - - - - 4, a.m. Mean velocity, 1.10 ditto.
Mean diurnal variation - - - 4 74 miles.

The Velocity of the Wind for a space of four minutes during the Thunder Storm on the night of the 29th, was at the rate of 38 miles per hour.

The column headed " Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination indicated by the self registering instruments at Toronto. The classification is to some extent arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows :—

(*a*) A Marked absence of disturbance.
(*b*) Unimportant movements not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from Noon to Noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Thunder Storms.—6th Thunder Storm 7 A. M.
9th Heavy Thunder Storm, 1 to 3 P. M. Rain and Hail.
11th Thunder Storm, Lightning and Rain 3 to 3—30 P. M.
29th Thunder Storm, 2 to 4 P. M. Tremendous Thunder Storm with Hail, Rain and high wind, from 10—30 P. M. till about midnight.

Highest Barometer - - 29.918, at 8 A. M., on 19th } Monthly range :
Lowest Barometer - - 29.135, at midnight on 29th } 0 783 inches.
Highest observed Temp. - 90.1, at 3h. 35m., P.M., on 21st } Monthly range :
Lowest regist'd Temp. - 48.5, at midnight on 31st } 41.6
Mean Highest observed Temperature - - 74.99 } Mean daily range :
Mean Minimum Thermometer - - - - 56 65 } 18.33
Greatest daily range - - 29.3 from 4h. 30m., P.M., of 22nd to A.M., of 23rd.
Warmest day - - 21st - - Mean Temperature - 76.72 } Difference :
Coldest day - - - 31st - - Mean Temperature - 56.47 } 20.25
18th—At 9h. P. M., large Meteor in N. falling in a line from *alpha* Lyræ, through Polaris.

The " Means " are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for July.

Year.	Temperature. Mean.	Max.	Min.	Range.	Rain. Days.	Inches.	Wind. Mean Velocity.
	°	°	°	°			Miles.
1840	65 82	79.4	48.2	31 2	6	5 270	--
1841	65 04	86 3	43.2	43.1	10	8.150	--
1842	64.25	90 5	42 0	48.5	4	3.050	--
1843	64 13	86.1	40.2	45 9	8	4.605	--
1844	65 61	86.1	40 5	45 6	12	2.815	--
1845	66.22	94.6	45.6	49.0	7	2.195	--
1846	67 72	94.0	41 9	49.1	9	2.895	--
1847	67 92	87.5	43.8	43.7	8	3.355	--
1848	65 83	82.7	46.7	36 0	10	1.890	4.91
1849	68 32	89.1	51.0	38 1	4	3.415	3 52
1850	69.01	84 9	52.8	32.1	12	5.270	4 56
1851	65 46	82.7	52.1	30.6	12	3.625	4 13
1852	66.68	90.1	49 5	40.6	8	4.025	3 33
Mean	66.31	87.23	46.19	41.04	8.5	3.889	4.10

REVIEWS.

Graham's Elements of Chemistry. Second American Edition. Edited with notes, by Robert Bridges, M.D. Blanchard & Lea, Philadelphia.

This work is undoubtedly one of the most valuable additions to Chemical Literature, that has been made for some years, and fully sustains the high character of its talented author. Mr. Graham, since the death of Edward Turner, has occupied the Chair of Chemistry in University College, London, he has long occupied a prominent position among the chemists of Europe, and many years experience in teaching have given him a remarkable facility of imparting knowledge in the most clear and comprehensive manner. There are many facts and theories connected with Chemistry and Chemical Physics which it is exceedingly difficult to render intelligible to the majority of students ; such, for instance, as the action of the Galvanic Battery ; the doctrine of chemical equivalents, &c., &c. ; and we may safely assert that we know of no work in which these subjects are so clearly and elegantly described as in the one before us.

In the part now published, we have an excellent treatise on heat, in

which all the more recent and interesting researches are fully noticed. Such, for instance, as the investigations of Natterer and Faraday, on the production of cold; Regnault on specific heats; and many others still more recent.

The chapters on the Effusion, Diffusion, and Transpiration of Gases, are exceedingly full and interesting, this being a part of science that has been more particularly studied and elucidated by the author. As connected with ventilation this portion of the work is of great importance. The chapter on Vapours and Hygrometers is excellent, but we think that the treatise on light as well as that on the transmission of heat, might with propriety have been considerably increased, inasmuch as both these branches have been so materially extended of late years, and are both intimately connected with Chemistry.

We are glad to observe that Professor Graham, in almost all cases, adheres to old nomenclature and rejects such newfangled names as chlohydric, sulphydric, which are in no respect preferable to those at present in use.

After a clear digest of Isomorphism, Isomerism, and Allatropism, the salt theories are described and apparently the author is inclined to favour the salt radical hypothesis, and adduces some strong arguments in its favour; we cannot but think, however, that the counter-arguments brought forward by the American editor are of still greater weight. It may be remarked that the notes appended by Dr. Bridges are numerous, and tend greatly to increase the value of the work. The chapter on chemical affinity, together with the explanation of the voltaic circle by means of chemical polarity, is perhaps the best in the whole work. As a method of instruction, it seems far more simple than any other plan, although few may be inclined to adopt so freely the purely chemical theory of the galvanic battery. We intend making a few extracts from this and other portions of the work—one on Golding Bird's battery, will be found at page 16, of the present No.

The remainder of the work treats of Chemistry proper, and extends to the Earths; it is equally excellent with the rest, and with some few exceptions may be considered as faithfully representing the present state of our knowledge of these subjects.

It is scarcely necessary to add, that the work is got up in Lea & Blanchard's usual excellent style, and is illustrated with a large number of engravings. We consider it without exception the best "Elements of Chemistry" yet published.

Report of the Toronto and Guelph Railway—by W. Shanley, Esq., Chief Engineer.

We have received a copy of the Report of the Chief Engineer (Walter Shanley, Esq.,) just issued, and regret that time will not permit us to consider it in detail. We have seen sufficient of it, however, to justify us in saying, that it is an able and highly interesting document. We perceive that Mr. Shanley makes a proposition (open to future consideration) in reference to the location of the Toronto Depôt, which would involve the construction of a water frontage throughout the length of the city, somewhat after the manner of the long talked of "Esplanade." We should rejoice to see his suggestions acted upon, but we think that in a matter involving such extensive public and individual interests, a unity of action should be required therein between all the Railway Companies proposing to establish Depôts, the Harbor Commissioners and the City authorities. It will be highly important as well for the convenience of the public as of the respective Companies that some plan common and acceptable to all should be adopted, and as the trade and revenues of the city are involved in the matter, such a course should be pursued as would secure to its inhabitants an arrangement suitable to their wants. Perhaps the economy of such a combination in the work would induce the ready assent of all parties, at any rate we may hope to hear more about it shortly, as we understand that negociations are already entered upon in the matter, between the Chief Engineers of the Railways having Termini in the City. We shall return to Mr. Shanley's Report in our next number.

MISCELLANEOUS INTELLIGENCE.

DOMESTIC.

GREAT WESTERN RAILROAD.

Synopsis of the Report of Rowsell G. Benedict, Esq., Chief Engineer, June 10, 1852.

To the Directors of the Great Western Rail Road Company.

Gentlemen :—

I have the honor to submit the following Report of the state and progress of the work on the line of the Great Western Railroad, as called for in the Resolution of the Board of Directors, dated 13th ultimo :—

Since my report of May 30th, 1851, until February, 1852, the expenditure, for construction, upon the road, has been confined entirely to the Central Division between Hamilton and London, a distance of 75 miles, and the Galt Branch, 12 miles; every effort being made to expedite the completion of the road, by continuing the work to the heavy points, leaving the lighter and more easily graded sections, until the position of the Company should warrant their commencement. The work, upon every section of these Divisions, is now in a forward state, and the grading can be completed if necessary, ready to commence laying the Superstructure, before next December, with the exception of a few deep cuttings, between Hamilton and Copetown.

In February last, the contractors for the Eastern Division, from the Niagara River to Hamilton, and for the Western Division, from London to Detroit River, were notified to commence their work and carry it forward with energy. I have the pleasure of reporting, that operations have commenced, and that the work of construction is now being vigorously carried on, on every section of the line from the Niagara to the Detroit Rivers, and the Galt Branch, a distance of 210 miles

The extreme and long continued high water in Lake St. Clair and its tributaries, during the present season, has retarded our operations on the Western Division materially, but I hope to be able to complete 100 miles of the road from the Detroit River east, by the 1st day of January, 1853. The work upon the remaining portion of this Division is of a heavy character, and will require until the summer of 1853 to complete. The most formidable part of it is within eight miles of London, and consists of heavy excavations, two bridges over the River Thames, and a large culvert at Woodhull's Creek.

Upon the Eastern Division, the contractors are making every preparation to secure an early completion of their heavy work, and during the present month two Steam Excavators will be at work between St. Catharines and the Niagara River. The grading from Hamilton to the Twenty Mile Creek—25 miles—will be ready for the Superstructure by the 1st day of October next.

The remainder of this Division, from the Twenty Mile Creek to the Niagara River, will require as long time for its completion as any other part of the road, comprising as it does several heavy sections and important structures.

The bridge to be erected over the Twenty Mile Creek will be 1200 feet in length and 60 feet high, and the bridge over the Sixteen Mile Creek 800 feet in length and of the same height. These two bridges are to be built with trusses of 100 feet span, and will contain upwards of one million feet of timber, which is now being prepared and delivered. The vallies of the Fifteen, Twelve and Ten Mile Creeks are crossed by embankments of about the same height, with culverts of sufficient capacity to pass the water of the Creeks at their greatest flow. The stones for these culverts, as likewise for the bridge over the Welland Canal, the St. David's road viaduct, and a great number of smaller culverts, are being placed upon the ground, and with three exceptions I hope to have the masonry on the entire line of road out of the way before next December, and to have the whole completed by June, 1853.

In January, 1852, the Desjardins Canal Company opened a negotiation with the Directors of the Rail Road Company for the purpose of endeavoring to secure a new and direct channel through the Burlington Heights for their Canal, which would allow the Railroad Company to fill up the present channel, and make a solid embankment for the track of their road from the Heights to the opposite shore; this proposition was rejected, your board preferring the original plan, with the prospect of ultimately having a bridge without a draw, although at an increased cost. During the suspension of the work on said section No. 1, and before it was relet, these negotiations were opened in different form, and the Directors of the Railroad, having satisfied themselves that they could not obtain the bridge as they wished, closed an arrangement with the Canal Company, whereby the site of the bridge is to be changed. This arrangement disposes of the only point on the line of the Railroad where the highest rate of speed could not be maintained without liability to accident. By the alteration, the present bridge will be placed at a point where it can be seen by trains approaching

from the East and West, and notwithstanding some £4,500 have been expended in the foundations and preparations for the old bridge, by this agreement with the Canal Company the new bridge will cost when completed less than to have proceeded with the work as originally intended, and the Railroad Company will effect a material saving, besides having a much safer bridge.

The grading done on the Railroad up to June 1st, 1852, is as follows:

Total number of cubic yards moved, ... 2,673,616
Rock and indurated earth of this amount, ... 340,493

The amount of Masonry laid, to June 1st, is as follows;

Total number of cubic yards, 14,780,

In addition to this amount of masonry, a large quantity of stone has been delivered, and is on hand, as well as timber and plank for foundations.

Total amount of Feet, board measure 1,086,378.

The total amount of expenditure for Grading, Masonry, Bridging, Superstructure, Fencing, Engineering, and Building, up to June 1st, according to the books of my Department, is as follows:

	£	s	d
For Grading, including grubbing and clearing	169562	12	5
" Masonry, including foundations and stone delivered	32041	19	5
" Bridging, including timber delivered,	7420	2	11
" Superstructure	4687	0	0
" Fencing	3906	17	5
" Engineering, etc	23087	4	7
" Building	179	8	0
Total	£239885	1	9

The Engineer department of the line now consists of the Chief Engineer, Associate Engineer, nine resident Engineers, eighteen Assistant Engineers, seven Draftsmen, two Office Cl rks, and the usual number of Rod and Tapemen for each Assistant.

An Assistant and party are stationed at the following points: Stamford, St. Catherines, Grimsby, Stoney Creek, Hamilton, Dundas, Fairchild's Creek, Galt, Paris, Eastwood, Ingersoll, Hoffman's, London, Wardsville, Thamesville, Chatham Light-house and Windsor. Two or three additional parties may be required after the 1st of July, until the 1st of January next. The Draftsmen are employed at Hamilton, where all of the plans and maps are made.

In addition to the above Engineering force, two Land Surveyors, with parties, have been in the field obtaining and defining boundaries. Maps of the different Townships through which the line runs from Niagara River to Chatham, have been completed to place on file in the offices of the County Registrars, showing the width of land taken on each lot—the number of the lot—the concession, and the name of the owner.

By resolution of your Board, passed in April last, all of the bridges and culverts on the road, from the Niagara River to Woodhull's Creek, west of London, a distance of 128 miles, are being constructed for a double track; those already built can be enlarged without material additional expense, when required.

Notwithstanding the unprecedented freshets during the last twelve months, and the remarkably severe winter just passed, the works upon the line have passed the ordeal without injury, except a slide at the Flamboro' road, which may cost from £1,250, to £1,500 to remove, and make the road permanent.

I was directed by your Board on the 15th of March last, to advertise for tenders for such buildings as would be required by the Company for the manufacture of the Cars necessary for an outfit, the Directors having decided to have them built in Hamilton, where they could be more directly under the supervision and inspection of the Engineer or some one appointed to overlook their construction. These Car shops consist of one building, 50 by 150 feet—two stories—with Engine house attached, 25 by 40; one building, 75 by 124 feet; and two buildings, 40 by 100 feet each. The first two are to be made of stone, and the last two of wood. On the first day of April, the contracts for these were given to Messrs. Searth and Firth for the stone buildings, and William Dodds for the wood, who have commenced erecting the same on the grounds of the Company, and will complete them by the first day of August next. The necessary machinery, Engine, &c., will then be ready to put up.

On the 20th of April by order of the Board I advertised for tenders for the following cars, to wit:

25 Passenger Cars.
4 Express and Mail Cars.
8 Baggage Cars.
20 Emigrant Cars.
100 Platform, Lumber and Iron Cars.
150 House Freight Cars.
100 Gravel Cars.
25 Repair Cars.
15 Hand Cars.

These Cars with the exception of the Gravel, Repair and Hand Cars, are to be of the large size, with 8 wheels and of the best description, the Passenger, Express, Baggage and Emigrant Cars to have the first quality of wrought iron wheels.

The competition for building these cars was spirited, and the contract was given to McQuesten, Williams, Dutton, and Brainard, who are now making contracts for the necessary machinery and materials. The rate at which this contract was given out is highly favourable to the Company, and is considered as low as the same quality of Cars can be purchased in the United States, thereby saving the Company the transportation and duties, which items in themselves will more than repay the cost of the buildings to be erected, even were they not needed by the Company on the completion of the road.

In pursuance of a resolution of the Board I shall immediately contract for such Locomotive Engines as will be required on the road before the opening of navigation in 1853.

The contractor for the piling in Burlington Bay is now at work, the necessary piles and timber for completing the docks having been contracted for during the past winter. It is my intention to have the station grounds of the Company in Hamilton filled up, and the wharves completed, by the Ist day of November next

The iron rails, weighing from 65 to 80 pounds to the yard, purchased by the Company last winter are coming forward, and will be delivered at Hamilton, Dundas, Welland Canal, Windsor and Chatham during the course of the summer.

From a knowledge of the character of the work, and taking into consideration the difficulties to be encountered in the prosecution of the same, I do not think it prudent to name a day for the opening of the whole line before August 1853, d ring which month, unless difficulties now unforseen and not anticipated, should arise, I do not doubt trains will make their regular trips between the Niagara and Detroit rivers.

Since the commencement of the work in 1850 I have had an opportunity of carefully overlooking the plans, estimates, and calculations of my predecessor Mr. Stuart, and I feel no hesitation in saying that I think his estimates were sufficient to complete the work upon the plan and in the manner specified by him. Some alterations have been made whereby the cost of the work will be increased, in other cases reductions have been made; but after making allowances for the increase of cost in consequence of building Bridges and Culverts for double track, for the substitution of culverts and embankments in many cases for temporary trestle work, for stone instead of brick work, etc., the cost of the road will not exceed the original estimate.

All of which is respectfully submitted.

ROSWELL G. BENEDICT,
Chief Engineer.

Engineer's Office, G. W. R. R.
Hamilton, June 10, 1852.

Present State and Progress of Telegraph Lines in Canada.—2,437 Miles of Wire.

Lines in Canada were first established some six years ago, commencing at Montreal and extending westward, and to the Niagara River, and subsequently to Quebec, and on the Ottawa River. The lines from Quebec, Montreal, Toronto, Hamilton, and to Buffalo, have proved lucrative to the stock-holders from the date of their construction. The line west from Hamilton to London, has not done as well so far as profits are concerned, from the fact that there has been no branch wires leading to it, and no through connection with the American line at the West. This, however. is about being remedied, and the line extended to Detroit, and there connect with five lines that now pass through that city. The original capital of the present lines in Canada, was double per mile what is now required, on account of the reduction of prices for all kinds of material. The last report of the Montreal Company exhibits the following.

Capital of the Company	$60,000
Profits of 1849	17 per cent
do 1850	17½ do
do 1851	20½ do

The three year's profits 55 per cent. The Company report a reserve fund on hand of $15,800 equal to 27 per cent. of the original capital after paying dividends. It is understood the stock has been mostly bought up, and is now in some eight or ten hands. The Toronto, Hamilton and Buffalo Telegraph Company Stock, has been recently consolidated with the Montreal Company. The present Telegraph Companies after a monopoly of six years, are now destined to find a powerful and energetic rival interest in the field. Through the influence of several wealthy gentlemen residing in the Upper and Lower Provinces, Mr. Snow, who has been extensively engaged in getting up companies in the States, and connected with the construction of over 5000 miles, was induced to visit Canada, with the view of establishing a grand Trunk Telegraph Line, from the Detroit River and the foot of Lake Huron to Quebec, connecting with the American Lines at various points, and also with the Line from Quebec to Halifax, with

branches from the Trunk line to all the important towns and villages in Canada. Since he came among us, he has exhibited an energy and perseverance rarely equalled, in the prosecution of his mission, visiting most of our towns and villages, while the enterprising portion of our citizens have vied with each other in seconding his endeavors to make "*Canada a Telegraphic net work.*" Mr. Snow has performed an immense amount of travel and labor, and succeeded in organizing Companies for the construction of Lines on twelve routes, amounting to near 1600 *miles!* The stock on most of them being filled and on the other portion, but a small addition is wanted. On some of the routes poles are being set, while on others wire is now being strung upon the poles. The longest line is the Grand Trunk, over 800 miles in length from Port Sarnia to Quebec, by way of Prince Edward's county. Eleven branches radiate from it making some 800 miles more. Wiring is to commence on the Trunk Line west, from Kingston this month, under the direction of A. F. Dwight, Esq, one of the energetic and enterprising Contractors. William Weller, Esq., of Cobourg, is President of the Grand Trunk Line; and Cecil Mortimer, Esq., of the Bank Agency at Picton, Treasurer. The Directors are all gentlemen of wealth, and the highest respectability, who reside on the Line. The following are the distances of the Grand Trunk Line and tributaries in Canada in addition to the American Lines. All are under contract to be in operation by April 1853.

TRUNK LINE.	MILES.
Port Sarnia to Hamilton	142
Hamilton to Toronto	48
Toronto to Kingston by Picton	210
Kingston to Montreal	190
Montreal to Quebec	200
TRIBUTARIES TO TRUNK LINE.	
On the Ottawa	150
Cobourg to Peterborough	30
Toronto to Barrie and Lake Huron	95
Toronto to Guelph and Goderich	130
Hamilton to Buffalo	70
Brantford and Buffalo Railroad	72
Brantford to Simcoe and Dover	33
Port Dover to Port Burwell	45
Port Burwell to Ingersoll	35
Port Stanley to London	27
London to Windsor	120
Miles of New Lines	1598
Miles now in operation	840
Total miles	2437

CAPITAL INVESTED.	
For Lines now in operation	$130,000
Do. in progress	160,000
	$290,000

The investment in these new Lines cannot but pay a handsome interest, while the public will be vastly accommodated, and put Canada at least on an equal footing with the States for transmission of intelligence, and all the important cities, towns, and villages, within a moment's distance of each other. Who would have imagined it two years ago?—*Simcoe Standard.*

The Trunk Line of Railway.

In consequence of the negociations which took place in London some time since between the Delegates of the Provincial Government and the leading firms of English Railway Contractors, Mr. Ross, Civil Engineer, has on behalf of Messrs Jackson, Peto, Brassey and others, made a tour of the Province with a view to ascertain the prospects and facilities which it affords for Railway construction. Mr. Ross has been accompanied by Mr. Thomas Keefer, C. E., and they have together visited the lines in both provinces already in course of construction, and the routes suggested for those in contemplation. Mr. Ross has already taken the contract for the Quebec and Richmond Railway, and it is inferred from the very favorable opinions that he has expressed, that the parties for whom he acts will be prepared at a very early date to enter largely upon the construction of other lines. Mr. Ross goes to England immediately, but is expected to return to Canada after a session there of three or four weeks.

Northern Railway.

Some new appointments have been lately made on this line, consequent upon the resignation of the Honorable H. C. Seymour late Engineer in Chief, whose heavy engagements in the United States induced him to retire from that office. The Company has appointed F. W. Cumberland, Esq., as his successor, and we understand that that gentleman has already entered upon his duties. It is not improbable that the line to Bradford (31 miles) will be opened on the 25th September, and it is intended to complete the remainder of the length to Barrie (69 miles) early in the ensuing winter. Four miles of the permanent way has already been laid, and the first Locomotive Engine is daily expected. The Toronto Depôt and Road Stations are to be constructed immediately.

St. Lawrence and Lake Huron and Peterborough Junction Lines.

The Report of the Engineer of the St. Lawrence and Lake Huron Line has been issued. It is proposed to connect the Ogdensburgh route with Peterborough and the Georgian Bay. It has not yet been determined where the Southern Terminus shall be located, whether at Kingston or Prescott; the original proposition was to the latter town, but in view of the early Construction of the Trunk line, Kingston may it is said be selected, as saving distance and answering the whole purpose. An application is about to be made to Parliament for a Charter to construct a Junction Line between Toronto and Peterborough—and a reconaisance has already been made of the route. Whether as a portion of a traffic line (by which it is affirmed the distance would be less than by the Lake shore) or a loop line to it, by which to connect the back Townships with Toronto and Kingston respectively, the scheme appears to be well worthy of favorable consideration.

The Great Western.

The works on this line are progressing with great rapidity. The Carriage Factories at the Hamilton Depôt are nearly complete, and the car builders will be put in early possession. All the arrangements have been made with reference to Locomotive power and general rolling stock, and throughout the whole length of the line there is full evidence of the most energetic action on the part of all concerned. Engineers in connection with this Company are now engaged on a survey between Toronto and Hamilton, and a charter will probably be obtained during the ensuing Session of Parliament authorizing its construction. In this route the two cities will be united at an early date, and (taking the whole length from the Detroit River to Toronto) a large instalment of the Trunk line will be secured.

The Brock Monument.

The Committee appointed to select a new design for the Monument to be erected to the memory of the late General Sir Isaac Brock, at Queenstown Heights, met last week at the Parliament Buildings, Toronto.

Considering the nature of the work to be constructed, and how seldom an opportunity is afforded for the exercise of taste in so popular and attractive a subject, the competition appears to have signally failed. This may probably be traced to the fact that most of the Architects declined to interfere in consequence of the claims of one of their number, whose design was approved and accepted some years since. Seven designs only were submitted and these were but from four Architects, and one Sculptor. One a Grecian Doric column, chaste and effective in character—by Mr. Young, (the author of the design originally adopted). Two from Mr. Thomas, the first a composite column on a high pedestal and stylobate, extremely graceful in design, of great attitude, but perhaps somewhat too delicately enriched, and the second, an arch surmounted by an Equestrian Statue of the General—which could not be said to offer any rivalry to the before mentioned work by the same master. Another design—a Greek column—of no established order—but elegant in outline and detail, by Mr. Hutchinson Clarke, of Hamilton, two by an anonymous contributor—a Corinthian column with a garland wreathed around the shaft, (!) and a Gothic Mausoleum of most wretched character and miserably rendered; with a Doric column having Sculptural ornamentation by a Boston Sculptor, completed the number of essays submitted for this unquestionably attractive subject. From amongst these the Committee has selected Mr. Thomas' Composite column, the construction of which is to be immediately commenced, and which when completed will doubtless approve itself to the public as worthy of its purpose and of the high reputation of its author.

Farmer's Associations.

We perceive by the Woodstock *Western Progress* of the 12th inst, that a Farmer's Association has been just formed in the Township of East Oxford, in the County of Oxford. This is a step in the right direction. We have time after time urged upon our agricultural friends the vast importance of the formation of similar associations throughout Canada, and we are pleased to see that farmers are at length beginning to comprehend the solid advantages likely to flow from them. Besides the diffusion of useful agricultural knowledge, the farmers' clubs promote a desirable friendly intercourse and sociability among farmers wherever they exist, from which the greatest good often flows. No community of farmers should be without one, and we trust that before long every township in Upper Canada will have its agricultural association. It has been said that union is strength, and with equal truth it may be said that union is knowledge; a union

amongst farmers promotes a knowledge of farming, and when it is well known that this is so, we are rather surprised that farmers associations are not more favorably considered by the generality of farmers than they are in some places at present. At the formation of the East Oxford Association, Mr. Alexander, who was subsequently appointed its President, delivered an admirable address on the benefit of Farmers Associations.—*Colonist.*

Provincial Exhibition.

The Annual Exhibition of the Provincial Agricultural Association, will be held in Toronto, on the 21st, 22nd, 23rd, and 24th of September. Extensive arrangements have been made to ensure a display of the produce and industry of the country, commensurate with the extraordinary increase in its population and wealth, since the last Exhibition held in this city four years ago.

The Local Committee in their address to the Citizens of Toronto express their confident expectation that the Ontario, Simcoe and Lake Huron Railroad will be opened, and the Locomotive in operation as far as Bradford, by the time fixed for the fair. A very large number of visitors from all parts of Canada and the United States is looked for, and (for the purpose of affording every facility to strangers to procure suitable accomodation) the Local Committee have announced their intention to keep a record of all Houses of entertainment in the city and Environs, as also the extent of accommodation each possesses and the charges for the same.

Premiums to be awarded by the Provincial Agricultural Association.

For Agricultural Reports of Counties in Upper Canada, for 1853. Open to general competition.

For the best County Report, (Wellington and Hastings excepted,)	- - - - -	£20 0 0
2nd	Do - - - - - - - -	15 0 0
3rd	Do - - - - - - - -	10 0 0
4th	Do - - - - - - - -	5 0 0

These Reports, in addition to the usual information required respecting the condition of Agricultural Societies within their range, should describe the various soils of the County; modes of Farming; value of land; amount of tillage and average of crops; breeds of live stock; implements and machines in use; methods of preserving and applying manures; sketch of past progress, with suggestions for future improvement. The manufacturing and commercial condition and capabilities of the County should likewise be stated, together with any other facts that would illustrate its past history or present condition.

All statistical information should be condensed as much as possible, and when practicable, put into a tabulated form. The main object of each report should be to afford any intelligent stranger that might read it, a concise, yet *an adequately truthful* view of the Agricultural condition and *Industrial pursuits* of the County. While all unnecessary particulars are to be avoided in the preparation of these Reports, *completeness* should as much as possible be kept in view.

The Reports must be sent in to the Secretary of the Board of Agriculture, accompanied by a sealed note containing the name and address of the writer, *on or before the 1st of April,* 1853; and no report will be received after that date. Such reports as obtain premiums will become the property of the Board.—*Agriculturist.*

FOREIGN.

Accidents in Mines.—Not less than 6000 of our fellow-creatures have been destroyed in the mines during the last ten years. Some of them have been shattered to pieces in the mine—projected against the sides of this terrible piece of ordnance; while others, out of its immediate range, in another part of the workings, have been instantly poisoned by the gaseous productions of the explosion. Others, again, have been drowned in the depth of the mine, and some have fallen many hundred feet and been bruised to death, while many have been crushed under tons of fallen roof, and the very likeness of man been destroyed.

At this juncture, as if guided by a special Providence, a strong and national society is preparing to make this subject its peculiar care. Practical and scientific men, as if anticipating its increased necessity, held a preliminary meeting in Westminster, on Wednesday, last week, to form a Society for the preservation of life from explosion and other accidents in mines. It was there resolved that a society having these objects in view, should have its seat in London, and its ramifications in every mining district.

We have the names of some of the first practical and scientific men of the day, as well as of Members of Parliament, who are prepared to support this Society. In London we have a concentration of the science of Europe, and the influence and the power of the kingdom, that will tender to the mines all human means and appliances suited for their dangerous condition; while practical knowledge and experience from the mines will offer to science the elements for experiment and calculation. Thus reflecting on each other, and proceeding hand in hand, they will bring to light a better and more secure mode for working our dangerous mines. Science, thus led by practical knowledge, enabled M. Jars, the French academician, to discover the laws of the natural ventilation of mines, and their dangerous condition at certain seasons. So led, Sir Humphrey Davy and Mr. G. Stevenson discovered the safety-lamp; and so led, Professor Bischoff, of Bonn, detected bi-carburetted hydrogen in some of the continental mines, that rendered the safety-lamp in them an instrument of danger. It was this which discovered that the same safety-lamp became a source of explosion in the hands of the miner, when passing through an explosive atmosphere of more than 3 ft. a second. It was this combination of science and practical knowledge that has given to the mines their various means of ventilation—the furnace, the fan, the ventilating-pump, the elevated chimney, and the steam-jet. It is this which has enabled us to penetrate nearly 2000 feet into the bowels of the earth, through quicksands and feeders of water, some of them 6000 gallons per minute, and to extract therefrom the minerals so important to the individual man and to the country. It is this combination that is the hope of the future.

A national society for the miners, inspired by humanity, and so influenced and guided, cannot but be productive of the most beneficial results.—*Mining Journal.*

Railway Statistics.—The length of railway open at the end of 1851 was 6890 miles; end of 1850, 6621 miles; and end of 1849, 6032 miles—showing an increase in mileage in 1851 over 1850 of 269 miles, and end of 1850 over 1849 of 589 miles.

Passengers.—The number of passengers conveyed on railways in the United Kingdom for the half-year ending the 31st Dec., 1851, was 47,509,392; for the corresponding period of 1850, 41,087,919; and for the corresponding period of 1849, 35,073,672—showing an increase in the half-year ending the 31st Dec., 1851, over the corresponding period in 1850 of 6,421,473 passengers, and for the half-year ending the 31st Dec., 1850, over the corresponding period of 1849 of 6,014,247 passengers.

Accidents.—In the half year ending the 31st December, the number of persons killed was 113, and 264 injured. There were 8 passengers killed and 113 injured, from causes beyond their own control; 9 passengers were killed and 14 injured, owing to their own misconduct or want of caution; 30 servants of companions or of contractors were killed and 17 injured, from causes beyond their own control; 32 servants of companies or of contractors were killed and 11 injured, owing to their own misconduct or want of caution; 33 trespassers and other persons, neither passengers nor servants of the companies, were killed and 9 injured, by crossing or walking on railways. There was one suicide.

The Gold Fields of Australia.—The Victoria gold fields still engross the chief attention of fortune-hunters, and really the outmovings appear to be immense. In five months—say, from October, 1851, to the beginning of March, 1852—the Victoria diggings yielded the enormous amount of 653,270 ounces of gold, which is valued at £2,319,10810s., or nearly $10,000,000.

The Bathurst and Turon diggings, which have been longer and more extensively worked than those of Victoria, have yielded up to March nearly 1,000,000 ounces of gold; the actual exports to March 20 being 1,125,317 ounces. These diggings yield as plentiful as ever, and new localities, abounding in rich deposits, are being met with in abundance.

In Van Dieman's Land gold has been discovered, but we have little more than the announcement. Large parties had gone out in different directions, with the view of prospecting.

Statistics.—In England, in the six years 1839 to 1844 the average number married annually was 1,546 in every 100,000 persons, composed of equal proportions of the sexes; whilst the greatest deviation in *excess* from the average was only 51, and in *deficiency* only 74, in the whole six years. The same singular uniformity was remarked in the number of persons married at different ages, in the proportion of men at one age with females at another age, and even between the conditions of persons marrying, viz.:—bachelors with spinsters, bachelors with widows, widowers with spinsters, and widowers with widows. The proportions are shown by tables to differ in a very slight degree in several successive years, and at different periods of age. Other kinds of observations may be pointed out, in which the action of the will is observed to be in such strict accordance with a general law, that calculation, though it might be at fault in a few cases, would be almost absolutely correct in predicting the results in a large population. The crimes of which persons are accused vary in their nature according to the age and sex; but during the twenty years in which they were registered in France, and during which the number accused was about equal to that of the deaths of males registered in Paris, the

former results were found to fluctuate less than the latter. The proportion of suicides to deaths (1 in 70 amongst males, 1 in 125 amongst females) and the age at which they are committed, the mode of death, and even the causes which lead to them, vary only in accordance with some general laws. Few know that in every seven minutes of the day a child is born in London, and in every nine minutes one of its inhabitants dies! The population of London is, roundly, 2,362,000. If the averages of the past 50 years continue, in 31 years from this time as many persons as now compose its population will have died in it, and yet in about 39 years from this time, if the present rate of progress continue, the metropolis will contain twice as many persons as it does now. The whole population of Liverpool in 1851 numbered 255,000; while the increase of inhabitants in the metropolis between 1841 and and 1851 was 413,000. It is truly marvellous! Where it will stop, and how food and shelter are provided for these masses, are subjects for speculation.

The Amazon.—Professor Graham has presented a chemical report to the Board of Trade on the cause of the burning of the ship *Amazon*, in which, after investigating the evidence on the subject, he comes to the conclusion that the origin of the fire must remain a matter of speculation and conjecture. He does not think that it originated in the spontaneous combustion of the coals, because they were Welsh, which are not remarkable for this property, and were shipped in a dry and dusty state. He conceives that the sudden and powerful burst of flame from the store-room, which occurred at the very outset of the conflagration, is strongly suggestive of a volatile combustible, which, according to two witnesses, was in the store-room, though this is denied by a third. Professor Graham found on trial that the vapour given off by oil of turpentine is sufficiently dense at a temperature somewhat below 110° to make air explosive on the approach of a light.

Prevention of Incrustations in Steam-Boilers.—M. Delandre states that he has succeeded in preserving tubular boilers, free from incrustation, by placing 2 lbs. of protochloride of tin in a boiler, which works 12 hours daily, with a pressure of 3 atmospheres, consuming in this time 1,500 to 1,600 quarts of water, and is only emptied and refilled once in eight days. For steam boilers which are emptied daily, and are of great power, the consumption of protochloride should be calculated at half a pound, for every cubic metre of water evaporated. The protocloride of tin is changed by the water into an insoluble basis and a soluble acid salt; the latter dissolves the earthy and calcareous salts. —*Artizan.*

Dr. Babbington, of London, some time since took out a patent for preventing incrustation by volaic agency. For iron boilers he recommends a plate of zinc 16 oz. the square foot, to be attached by one of its edges by solder, to the interior of the boiler; and both sides of the plates being left exposed to the action of the iron and water, voltaic agency thus excited, is said to have the desired effect. For large boilers, two three or more plates may be used as necessary.

Steam-Boiler Explosions.—An invention has been registered by Mr. Dangerfield, of West Bromwich, for the prevention of steam-boiler explosions. The apparatus is very simple, consisting of a valve, which is screwed to the top of the boiler, over which stands a hollow fluted column about 3 feet high, forming a box to contain the weights on the valve, and a pillar for a wheel, over which works a flat chain connected with the buoy in the boiler, having at equal distances two long links, one on each side of the pillar. Two levers, connected with the valve, and fixed on centres, pass between the long link, so that the water in the boiler, rising or falling beyond a given level, depresses the lever, opens the valve, and permits the steam to escape. An index is fixed on the wheel which gives the height of the water in the boiler; the steam is also weighed without the addition of levers, and the weights are securely locked in the pillar to prevent alteration.

New Planet.—Mr. J. R. Hind has announced that a few nighs ago he "disvovered a new planet on the borders of the constellations Aquila and Serpens, about 5 degrees east of the star Tau in Ophiuchus. It shines as a fine star of between the eighth and ninth magnitudes, and has a very steady yellow light. At moments it appeared to have a disc, but the night was not sufficiently favorable for high magnifiers. At 13h. 13m. 16s. mean time, its right ascension was 18h. 12m. 58 8s., and its north polar distance 98 deg. 17m. 0 9s. The diurnal motion in R. A. is about 1m. 2s. towards the west, and in N. P. D. two or three minutes towards the south."

At a meeting of the Society of Antiquaries, lately held in London, Mr. Wright, by permission of the owner, exhibited a sword, a spear-head, and what he denominated an arrow-head of the Anglo-Saxon period, from whence he argued that the Anglo-Saxons used bows and arrows. Mr. Akerman expressed more than strong doubts on the question, and was of opinion that the so-called arrow-head had belonged to a small javelin. Our notion is that of Mr. Wright,—and it is very well ascertained that the Ancient Britons, whatever might have been the practice of the Saxons, employed bows and arrows, and pointed the latter with flint.

An account of the receipts and disbursements of the home treasury of the East India Company, from the 1st of May, 1851, to the 30th of April, 1852, shows that the receipts have been £6,099,852 8s. 5d., and the disbursements, £3,734,003 14s. 6d., leaving a balance in favor of the company, on the 30th of April, 1852, of £2 365,848 14s. It is estimated that the receipts of the home Treasury from the 1st of May last to the 30th of April, 1853, will be £3,858,521, which, with the balance in hand, will make the total amount £6,224,369. The disbursements for the same period are estimated at £4,439,272, which will leave a balance in favor of the company on the 30th of April, 1852, of £1,785,097.

The great Fire at the Printing Office of Messrs Clowes, in London, in the month of June last, by which property to the value of £50,000 was destroyed, has, it appears, a more direct interest for Canadians, than the readers of the announcement in the papers, were probably conscious of. A part of the twenty thousand reams of paper consumed, consisted of the sheets of 457 pages of the forthcoming Volume of observations at H. M. Magnetical Observatory at Toronto, the whole of which have therefore to be reprinted.

It appears from the returns prepared by the Board of Trade, that during the five months ended the 5th of June last, we imported no less than 52,338,676 eggs, the whole of which were entered for home consumption. Of these, two-thirds were delivered to supply the London markets. The average monthly consumption of foreign eggs is 15,000,000. The importations of butter during the first five months of the present year were 117,797 cwt., against 129,936 cwt., in the corresponding period of last year.

It is stated that arrangements are in progress for extending the privileges of sending books, magazines, and pamphlets by post, at the low rates adopted for inland carriage of these articles, to the settlements of Australia.

From official returns just published, it appears that the Irish emigration in ten years (1841 to 1751) numbered 1,289,133 persons. The decrease in the population of Ireland between 1841 and 1851 was 1,659,330.

It is said that Col. Rawlinson has opened out the entire place of sepulture of the Kings and Queens of Assyria. There they lie "in huge stone sarcophagi, with ponderous lids decorated with the Royal ornaments and costume, just as they were deposited more than 3000 years ago."

It is proposed to construct a new Bridge on or near the site of Blackfriars bridge, to be of cast iron, and have only five arches instead of seven. The centre arch would thus be 150 feet open and the two side arches 140 and 130 feet respectively.

Mr. A. W. Pugin, the celebrated Architect, has become the inmate of a Public Hospital. His mind having given way under an excessive strain of professional and nervous excitement.

ERRATA.

Page 10—Line 40.—For "shut," read "sheet."
Page 16—Line 10.—For "bichlorides," read "chlorides."

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the improvement in Art and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the Members of the Canadian Institute than the means the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, SEPTEMBER, 1852.

CONTENTS:

PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

The Canadian Journal.

TORONTO, SEPTEMBER, 1852.

In the August Number of the Journal we alluded briefly to its objects, and enumerated in general terms the sources from which we hoped to obtain co-operation and support. We now propose to consider more in detail the manner in which that co-operation may be afforded, not, however, intending to restrict in any way the intentions of our well-wishers, but rather with the view of suggesting subjects of enquiry and observation which some of our readers might consider unsuitable to the pages of this Journal, or the objects of the Canadian Institute.

First, then, we attach great importance to the opportunities for observation and discovery presented by railway operations now in progress in various parts of Upper Canada, and would warmly urge upon the gentlemen engaged in the construction of the different lines the importance of accurately recording the many interesting facts which are daily disclosed. We recently noticed in a local paper* a short account of the discovery of an Indian burying-ground by the workmen on the Great Western Railway, in excavating a bank in the neighbourhood of Windsor. "In the burying-ground were found a large number of Indian ornaments, consisting of silver pins, brooches, bracelets, amber bead necklaces, &c., also, red stone pipes, copper camp kettles, and a variety of articles usually buried with an Indian. The place where these things were found was an Indian burying-ground. A great many skulls, bones and skeletons have been disinterred."

With a view to collect accurate and complete information on such interesting revelations as the one to which we have just adverted, the Canadian Institute, in a circular of enquiry dated June 12th, 1852, proposed (and distributed far and wide) a number of queries which we subjoin:—

Indian Remains.—Although the subject of Indian mounds and intrenchments has of late years received much attention in the neighbouring States, and it has been shewn by the investigations of Mr. Squier† and others, that they exist in considerable numbers in western New York—particularly in the region occupying the first and second plateaux round Lake Ontario—Upper Canada, a part of the same region geographically, and peopled originally by the same, or nearly allied races, remains to a great degree a *terra incognita* with respect to this enquiry. The Council of the Canadian Institute deem it one particularly worthy of the attention of those persons who, by their pursuits, are brought into contact with such objects; and from the professedly practical character of their body, one of those also upon which authentic and valuable information may be looked for, at the hands of its members, as an early result of its incorporation.

To one county alone, of the State of New York, (Jefferson County,) Mr. Squier was enabled to discover fifteen inclosures or intrenchments, and he has estimated the total number which formerly existed in that state, at from two hundred to two hundred and fifty. "Were these works," he remarks "of the general large dimensions of those of the Western States, their numbers would be a just ground of astonishment. They are, however, for the most part, comparatively small, varying from one to four acres, the largest not exceeding sixteen acres in area. The embankments, too, are slight, and the ditches shallow: the former seldom more than four feet in height, and the latter of corresponding proportions. The work most distinctly marked exists in the town of Oakfield, Genesee County; it measures, in some places, between seven and eight feet from the bottom of the ditch to the top of the wall. In some cases the embankment is not more than a foot in height, and the trench of the same depth. Lest it should be doubted whether works so slight can be satisfactorily traced, it may be observed that a regular and continuous elevation of six inches may always be followed without difficulty."

"In respect to position," adds the same writer, "a very great uniformity is to be observed throughout; most occupy high and commanding sites near the bluff edges of the broad terraces by which the conntry rises from the level of the lakes. When found on lower grounds, it is usually upon some dry knoll or little hill, or where banks of streams serve to lend security to the position. A few have been found upon slight elevations in the midst of swamps, where dense forests, and almost impassable marshes, protected them from discovery and attack. In nearly all cases they are placed in close proximity to some unfailing supply of water, or running streams. Gateways, opening toward these, are always to be observed, and in some cases guarded passages are visible."

To this clear and concise description little need be added. The enquiries proposed by the Canadian Institute, are the following:—

1. Name of township and number of lot in which any Intrenchment or Mound exists.

2. The area and dimensions, from actual measurement, and if possible, a plan, with sections.

3. A general description of the situation and neighbourhood.

4. Are there any trees growing *on* the artificial earthwork, if so, their size, the number of rings of annual growth in the largest *stump* to be found? To cut a tree down to ascertain this fact, unless they are numerous, would be to destroy a very valuable standing evidence to the antiquity of the work.

5. Are there still, or *were* there, previously to clearing, trees of large size *in* the area of the work?

6. Is the place known to the Indians in the neighbourhood by any name? Have they any traditions respecting it?

7. Are stone axes, arrow-heads, weapons or utensils, ever ploughed up in the vicinity? Is broken pottery common? Have the remains of concealed stores been discovered? Specimens of any of these objects will be highly valued.

8. Are there evidences of the place having been surrounded with posts or pickets?

9. Have utensils or weapons of copper or iron ever been discovered, leading to the inference that the place was occupied since the intercourse of the natives with Europeans began?

10. Specimens of Indian skulls or crania having evidence of antiquity will be valued. But the Council distinctly disown any wish or desire to disturb native burial places of comparatively recent date, and strongly recommend that they be treated with respect.

11. Are there any mounds or tumuli of artificial construction, or any mounds or elevations which from their regularity suggest a suspicion of such an origin, if so, state the same particulars respecting them?

12. Are there any local names of Indian origin in your township or neighbourhood; if so, a list of them, indicating the language to which they belong, their correct pronunciation, their interpretation or meaning, and the local circumstances on which they may appear to be founded, will be highly acceptable?

13. Copies of any noteworthy native drawings or writings, such as those existing on what are called the pictured rocks of Lake Superior and Lake Huron, and generally drawings of any objects connected with the subjects of these enquiries, will be thankfully received.

We solicit the attention of those who are interested in the attractive subject of Indian Remains to the foregoing enquiries. For our own part, we shall at all times be glad to introduce into the Journal wood-cuts of any relic possessing peculiar interest, when transmitted for the inspection of the Institute, or as a contribution to the Museum now in progress of formation.

Another subject of much scientific and economic importance is involved in the collection and publication of accurate descriptions and diagrams of strata, which may be disclosed by deep cuttings, either in the drift formation or in rocks upon which the drift reposes. Fossil remains of large dimensions are not unfrequently found in the drift, and the foundation limestone rocks of the Western part of the Province teem with innumer-

*The *Canada Oak.*

†Smithsonian contributions to knowledge: *American Journal*, Vol. XII, No. 3?.

able relics of former organic life. Much interest has recently been excited by the discovery of the bones of an animal of large dimensions in the neighbourhood of Hamilton, called an 'Elephant,' (Mastodon?) We have seen no scientific description of the remains, although they possess singular interest and have acquired considerable notoriety.

Fossils and minerals of every description, when properly arranged and described in a public Museum, acquire a value which they can rarely or never attain in private hands. In this new and comparatively unexplored country, the scantily furnished Cabinet of an amateur, unless he be professionally interested in mineralogy or palæontology, or possessed of industry to describe the few treasures accident or search may have furnished him with,—lie shorn of more than half their value, because they do not thus contribute to public knowledge, or advance the interests of Science.

Railway operations in Great Britain have given an extraordinary impetus to Geological science during the last twenty years. They have opened up the mineral treasures of the country in marvellous abundance, and every advantage has been taken of the opportunities so frequently offered. It would be a matter of lasting regret if the splendid facilities now within our reach, should be permitted to slide from our grasp without being improved to the uttermost.

The Council of the Canadian Institute in their circular of enquiry already referred to, have endeavored to give a practical and useful direction to the exertions of the members and friends of the Institute by soliciting information respecting the Limestones of Canada. It is unnecessary for us to enlarge upon the economic importance of the material, or enumerate the many useful purposes to which it is applied. It is not generally known however, that the Farmer, the Builder, the Smelter, the Soap-boiler, the Soda-maker, the Candle-maker, the Bleacher, &c., &c., all require it in processes to which special varieties are peculiarly applicable. It is with a view to their classification and analysis, that the Council have determined to institute the subjoined :—

ENQUIRIES REGARDING THE LIMESTONES OF CANADA.

Inasmuch as it does not appear that the Limestones of Canada have as yet been fully examined, by analysis or otherwise, in reference to their economical values, or classified for practical purposes, it has been determined by the Council of the CANADIAN INSTITUTE, to collect for its Museum, in aid of these objects, specimens of Limestones from the various localities within the Province; they accordingly request that all parties who, by residence or information, may be able to assist the Council in this matter, will be pleased to transmit to the Secretary of the Institute, replies to the accompanying questions, with specimens of the Limestones or Limes to which they refer; and to add to those specimens which are selected, as illustrating the economical uses more particularly in view, any which exhibit fossil remains of whatever kind.

The following is a list of the localities in which Limestones are known to exist,* extracted from a paper prepared by W. E. Logan, Esq., F. R. S., the President of the Institute.

Malden—Manitoulin Islands, along the south side—St. Joseph Island—coast of Lake Huron, from Cape Hurd to Rivière au Sable (north)—various parts from Cabot's Head to Sydenham, in Owen's Sound; and from Sydenham, by Euphrasia, to Nottawasaga; thence by Mono to Esquesing, and by Nelson to Ancaster—Thorold—Matchedash Bay—Orillia—Rama—Mara, and various parts of Marmora—Madoc—Belleville—Kingston—MacNab—Bytown, and various parts of Plantagenet and Hawkesbury—Cornwall—Isle Bizard—Beauharnois Island—Caughnawaga—Montreal—Isle Jesus—Terrebone—Philipsburgh—St. Dominique—Grondines—Deschambault—Beauport—Bay St. Paul, and Murray Bay—Upton—Acton—Wickham—Stanstead—Hatley—Dudswell—Temisconata Lake—Gaspé—Port Daniel—Richmond—Anticosti Island.

Hydraulic Lime is found in the following places :—Point Douglas, Lake Huron—Cayuga, 3½ miles below the village, on the Grand River—Thorold—Kingston—Nepean, near Bytown—Argenteuil.

Magnesian—Exit of Lake Mazinaw—North Sherbrooke, C.W.—Drummond—St. Armand—Durham—Sutton—Ely—Durham—Melbourne—Kingsley—Shipton—Chester—Halifax—Inverness—Leeds—St. Giles Seigniory—St. Mary Seigniory—St. Joseph Seigniory.

Replies to the following questions or other information on the subject will be thankfully acknowledged :—

1st. The number of the specimen referred to (if any be forwarded.)

2nd. The name of the locality (No. of the lot, concession, and name of township and county) from which the same has been taken.

3d. The geological position of the bed, its thickness, dip, superior and inferior strata, the nature of the surface, soil, &c. &c. &c., if known.

4th. The analysis: if it has been ascertained.

5th. Whether it exists in quantity and position to warrant its economical use as an article of commerce, and the facilities for transportation.

6th. Whether it exhibits any hydraulic properties and to what extent.

7th. If Lime has already been manufactured from the stone referred to—transmit a sample—and state the manner of its manufacture—if peculiar—and in what works the same has been used.

We shall advert to other important subjects of enquiry in future numbers of the Journal; in the meantime, we call attention to the admirable paper by Capt. Lefroy, which has especial reference to the highly interesting subject of climate.

* NOTE.—The quantities in the localities indicated are not in every case of a sufficient amount to be profitably available, but they are always of sufficient importance to draw attention to the localities as a possible guide to the discovery of others in the vicinity where quantities may be greater.

On the Atmospheric Phenomena of Light: by J. Bradford Cherriman, M. A., F. C. P. S.,

(Fellow of St. John's College, Cambridge, and Dep. Prof. of Mathematics and Natural Philosophy in the University of Toronto.)

(CONTINUED FROM PAGE 6.)

There is still remaining an extensive class of phenomena known under the generic name of *halo*, and comprehending a great diversity of appearances, about which much difference of opinion has prevailed among philosophers. It is now, however, generally conceded, that the theory proposed by Mariotti, and permitted for a long time to lie dormant, until re-discovered and worked out by Young, is sufficient to account for most, if not all, of the observed facts, its results agreeing with them not only in general character but even in the details of measurement. According to this theory, the phenomena arise from the various refractions and reflections of the rays of light by the crystals of snow or ice in the air; which crystals, as is well known, all exhibit more or less the angle of 60°, their general form being that of triangular or hexagonal equilateral prisms, terminated by plane bases at right angles to their sides.

The following is an account of a *halo* observed near Toronto by Mr. H. Y. Hind, on 8th March, 1847 :—

"A ring of a dull orange colour towards its inner boundary, was visible about 24° from the Sun, together with a second ring of fainter colour, distant about 24° from the former. In the circumference of the inner ring, exactly opposite each other, and equally distant from the horizon, were two mock-suns, well defined towards the Sun itself, and of a dull orange colour, but shooting out into a vivid streak of light, some 10° on the opposite side, parallel to the horizon. Two other coloured arcs of more vivid colours than the former, and seemingly of nearly the same radii, touched them in their vertical points, with their convexities turned towards the Sun. At the points of contact,

the colours were most distinct, being in those parts towards the Sun of a deep orange, but on the inner boundary of the two latter arcs of an indigo blue, the intervening space of a light green."

The radius of the inner ring, as measured by Captain Lefroy, at Toronto, was 22° 53′.

In another halo, observed February 9, 1851, by Mr. James S. Clouston, C. T., at Moose Factory, we find "a horizontal circle of a whitish colour passing through the sun; a halo round the sun of about 22° radius, at the point of intersection of which with the former were two very bright mock-suns; a second halo of about 45° radius, faintly tinged with the prismatic colours, (and as in the previous one) two arcs touching them at their highest points, convex to the sun, both coloured, but the colours of the second being very vivid like a rainbow; on the horizontal circle, two faint elongated mock-suns, each about 120° (90° ?) on either side of the sun, and a third directly opposite to the sun, and very much elongated." Captain Back describes a lunar halo in which a white cross passed through the moon bounded by a halo of 22°, and having a mock moon in the end of each branch of the cross. In a halo of the sun, observed by Hevelius in 1661, A. D., no less than six mock-suns were seen, as also in another observed by M. Lambert, in June, 1838. At Kiaihta, in Siberia, on February 4, 1829, at sunrise, were seen luminous rays issuing on both sides of the sun, (known in that country by the name of the sun's ears,) which extended gradually till they made the complete tour of the horizon, forming a circle in the circumference of which were situated seven mock-suns. But of all recorded halos, the most complex and gorgeous is the one seen at Gotha, on May 12, 1824, and of which a full account may be found in the Ency. Met. Art. Meteorology.

It will be now seen that the term *halo* indicates a phenomenon so complicated as to render its description difficult, no observer having ever yet seen it complete, and the appearances often changing during the time of observation ; however, the principal parts of it may be thus defined :—

1. A horizontal white circle passing through the sun and making the complete circuit of the heavens.

2. A vertical white circle, also passing through the sun and terminated by the horizon.

These are produced by reflection of the sun's rays, the former at the faces of the ice-crystals, whose axes are vertical and at the bases of those with axes horizontal ; the latter at the faces of the prisms, whose axes are horizontal and perpendicular to the vertical plane through the sun and spectator. The crystals tending to arrange themselves according to the law of least resistance, will naturally be found in greater abundance with their arcs horizontal or vertical, than in any other position.

3. These two circles form the white cross in Captain Back's halo, and at their other point of intersection give rise to a pale and vivid mock-sun, which is consequently just in the opposite point of the heavens to the real sun and at the same height above the horizon.

4. Two other white circles of very rare occurrence passing also through the sun and the above-mentioned image, and equally inclined, though at a variable angle, to the vertical circle (2.) These arise from reflection at the faces of prisms when a considerable number of them happen to have their axes inclined at the same angle to the vertical.

5. Three circular coloured rings, or *halos proper*, surrounding the sun and having radii about 22, 46, and 90 degrees respectively. They all display the prismatic colors, the two interior having red on the inside and violet without, (these being distinguished at a glance from *coronæ* or where the order of colour is the reverse), the third or outermost on the contrary has violet within and red without. Inside the first halo is comparative darkness, but on the outside its violet fades away into the azure of the sky, succeeded again by a darker space just within the second halo, between which and the third is considerable illumination followed by darkness outside the third. Of these the first is produced by rays refracted through two adjacent faces of the prisms in such a position that the refracted ray undergoes the least deviation ; the second by those refracted in like manner through a face, and issuing through the base, and the third by rays issuing after one internal reflection exactly as in the primary rain-bow. The results of theory agree in all particulars with regard to these, with the observed facts, but there is mention made in one of Captain Parry's halos of a prismatic circle of 38° radius, and in a halo seen at the Observatory in Toronto, on March 9, 1841, of one of 30° radius ; if these were not simple *coronæ* (the order of colours is unfortunately not mentioned in either case), and the measurements be accurate, they must be regarded as facts yet unexplained, and it appears very difficult to frame any hypothesis for them.

6. Two circular coloured axes, generally of great brilliancy, touching the first halo at its highest and lowest points, and turning their convexity towards the sun, being red outside and violet within. These are formed in the same manner as the first halo, by prisms with axes horizontal, and occurring in great numbers. The circles will have the zenith for their centre, their apparent diameters varying with the sun.

7. Two precisely similar rings, touching the second halo in its highest and lowest points, produced, according to M. Galle, in the same manner as the second halo, by prisms whose axes are vertical; but this explanation does not seem satisfactory.

8. Two other circles—very rare—touching the second halo at points distant 60° from its lowest point, of which no account has yet been given by theory.

9. Lastly, at, or near, all the intersections of the halos proper with the vertical and horizontal circles (1 and 2), have been observed, at one time or other, images of the sun, mock-sun, or parhelia as they are called, in number eleven. Those of the first and second halo generally appear coloured like the halos themselves, and spread out tails tending away from the sun along the white circles; but in those of the third halo, which are extremely rare, the colours have never been seen, owing to the faintness of this halo. They occur generally a little outside of the exact intersection of the circles, which is successfully explained by Venturi, from the fact of the refraction not taking place exactly in a plane perpendicular to the edge of the prisms.

There may be other varieties of the halo which are not included in the above enumeration; and, indeed, the vast diversity of forms which the ice-crystals may take, and the great number of ways in which they may present themselves to the sun, evidently offer a complication of circumstance that baffles analysis or description. There is still a class of phenomena depending on the atmospheric polarization of light whose examination must be reserved for a future occasion, and also a few of which it may be doubted whether they are due to atmospheric action; thus, not to mention the auroral arch and zodiacal light which some have attempted to resolve into atmospheric phenomena, the dark lines of the solar spectrum and the twinkling of the stars may, with much probability, be thus referred. Of the former of these two, no attempt even at explanation has yet been made, and the latter has been the *crux* of optical science for ages. It consists, as may be seen any clear evening, in the star undergoing rapid changes of intensity and colour—

"The fiery Sirius alters here,
And bickers into red and emerald———."

Philosophers, from Aristotle down to Newton, have tried their hands in framing hypotheses, more or less ingenious, to account

for this; but later observers have contented themselves with upsetting all previous explanations, and confessing their own ignorance. It was understood, some time ago, that M. Arago had succeeded at length in deducing the facts from the undulatory theory; but his memoir, if ever published, I have unfortunately not seen. Some remarkable appearances, though not difficult to explain, offer themselves during a total eclipse of the sun, of which a very interesting description may be found in Hind's Solar System.

Gas Patents, by Henry Croft, D. C. L., Professor of Chemistry in the University of Toronto.

There is scarcely any branch of chemical manufacture which has attracted so much attention, and has been made the subject of such numerous patents as that of coal gas; we mention coal gas alone, for although various proposals have been made, and several carried into execution, for extracting a gas fitted for illumination from numerous other substances; such for instance, as oil, fats, rosin, bitumen, soap-suds, and even water, it does not appear that any one of them can take the place of that from which the gas was originally produced, viz., coal.

Whether we regard the convenience and utility of this illuminating principle, or the enormous saving of expenditure when its use is contrasted with that of all other ordinary combustibles, or the numerous useful applications which have been made; among the most interesting of which may be mentioned the singeing of calico and of thread, formerly effected by much more clumsy contrivances; we cannot but consider this branch of manufacture as one most deserving our attention and worthy of more especial notice.

Many improvements have been effected in various departments of this manufacture, as may be seen from the fact of there having been from sixty to seventy patents or specifications registered in the Patent Office up to the year 1850. Since that time many more have been entered, some of which will be briefly noticed in the present paper.

Although the general application of coal gas to the purposes of illumination may date from the commencement of the present century, yet the knowledge of its properties was obtained at a much earlier period. In letters written in 1688-9, by Mr. Clayton, Rector of Crofton, at Wakefield, in Yorkshire, addressed to Robert Boyle, and afterwards to the Royal Society, we find a tolerably accurate account of the method adopted by the author for preparing a gas from coal, and also of its properties more especially as regards its inflammability.

Between 1770 and 1780 various experiments were made by Hales and Watson on the production of an inflammable gas from coal and other substances, but the first, though unsuccessful, attempt at the application of such product to useful purposes seems to have been made by Lebon in France, during the years 1785-6. The substance employed by him was wood, which does not yield nearly so good a gas as common coal, a fact which may probably account for the failure of his experiments.

In the year 1792, Murdoch lighted his dwelling house with gas, and in 1798 a gas-work was established in the factory of Messrs. Bolton & Watt, with whom Murdoch was connected.

For some years subsequent only a few private factories were furnished with this valuable means of illumination. It was first applied to lighting streets in 1804, when Pall Mall in London was furnished with gas, to replace the clumsy and inadequate oil lamps, which all old residents in that city may remember. Since that period the use of gas for this purpose has become thoroughly appreciated and most widely extended.

Gas which may be applied to the purposes of illumination is frequently found in nature, exuding either from the soil, or rock or passing up with mineral waters. The holy fires of Baku, the natural gas of Fredonia, (on Lake Erie,) the so called burning springs above the British Falls, and at Hamilton, the burning fountain of Dauphiné, as well as many others in various parts of the world might here be mentioned. The gas which is thus evolved is not, however, of the same nature as that obtained artificially from coal, although coal gas does, under certain circumstances, contain a very large proportion of the above mentioned compound, and a very considerable quantity in all cases. The evolution of this gas is not, therefore, to be taken as a proof of the existence of coal, although in the coal mines it is the substance which so frequently produces such calamitous accidents, being generally known by the names of fire damp, marsh gas, &c.* It appears that long before coal gas was employed in England, the Chinese were in the habit of employing the natural product for the purposes of illuminating and heating.

Before entering upon the improvements which have been effected in the manufacture, it may be well to describe, in a few words, the process as originally adopted, and the objects of its several parts. The coal being heated strongly in cylindrical iron retorts, gives off a mixture of various gases, together with certain oils, tar and water holding in solution several salts, principally of ammonia. From these bodies the gas is purified, firstly,—by traversing a large tube or reservoir called the hydraulic main; and, secondly,—by passing through a series of pipes kept cool by a stream of water. The mixed gases are then conducted through the purifiers, which are large vessels filled with a mixture of lime and water; noxious gases, and some which are either not combustible or do not give out any great light when burnt are thus removed, and the so purified gas is then passed off into the gasometer or collecting vessel.

In each of the processes above described great improvements have been effected, while other contrivances have been attached to the factory, either for the purpose of improving the quality and illuminating power of the gas, or of rendering available, for technical purposes, the different products obtained during the process.

The improvements may be classified under three heads:

1st. As regards the quantity and quality of gas produced from a given weight of coal.

2nd. As regards the efficiency and economy of the purifying process.

3rd. As regards the illuminating power of the gas.

The quantity of gas produced depends principally upon the nature of the coal subjected to distillation, the finer cannel coal yielding as much as 18,000 cubic feet of gas for every 100 cubic feet of coal, while poorer kinds do not give more than 9000. The quantity will also depend, to a considerable extent, on the rapidity with which the coal is raised to a cherry-red heat; if the coal be damp, and the heat raised slowly, a large quantity of tar will be produced, much of which will distil off without producing gas. The quality of the gas varies with the duration of the process, during the first hour that substance which gives its strong illuminating power to the gas is found to the extent of 13 per cent., while at the end of 5 hours there is only 7 per cent., and at the end of 10 none at all, and the gas, consequently, when burning, gives out little or no light. Olefiant gas, (the illuminating principle) which burns with a brilliant white light,

* The explosion which occurred some few weeks since, in a well on Queen Street, Toronto, but which was fortunately not attended by any serious consequences, was undoubtedly owing to an escape of this gas from the bottom of the well.

when brought into contact with red hot iron for any length of time becomes decomposed, it deposits either a portion, or even the whole of its carbon, and becomes converted, in the former case, into marsh gas, in the latter into hydrogen, both of which give out but little light when burning. From these considerations it becomes apparent that dry coal should be used, that it should be heated as rapidly as possible, and the process not continued beyond five hours.

The retorts have been the subject of great improvements as regards their shape, nature and arrangement. The old cylindrical iron retorts have given place to flat-bottomed or even kidney-shaped ones, clay vessels have been introduced to save the destruction of the iron, and an arrangement which seems to be perhaps the best is a combination of both plans. Seven clay retorts are heated by a fire placed in the centre of them, the flames play round these vessels and descending heat five iron retorts. It is found that the metal is thus much less acted upon than according to the old plan. According to Lowe's patent one-half of the retort only is charged at one time, and openings are made at each end; the halves are charged alternately. The propriety of this arrangement seems doubtful, owing to the ready decomposition of olefiant gas when in contact with a strongly heated surface as already mentioned. According to Croll's patent one half of the retort is charged with coal, the other half with coke, when the coke becomes red hot, steam is driven in (15 lbs. of water to 1 ton of Newcastle coal) which passing over the red hot coke and becoming decomposed mixes with the gas arising from the coal. The rationale of this process will be mentioned hereafter.

The purification of the gas is perhaps the most important part of the process, and is even, at the present day, constantly undergoing some improvement. The gas as evolved from the retorts contains, among others, the following gases:—Olefiant gas, light carburetted hydrogen (marsh gas,) carbonic oxide and hydrogen. The three latter are, in point of illuminating power, nearly useless, although they may perhaps serve as a diluent for the otherwise too powerful olefiant gas; their removal, therefore, from the mixture would probably not be advisable, even if it were possible.

There are other substances, however, in the mixture, which if allowed to remain would be positively injurious, such as carbonic sulphurous and muriatic acids, sulphocyanogen, sulphuretted hydrogen and ammonia; of these, the first five may be perfectly removed by means of the lime purifiers, whether they be in a free state or combined with ammonia, but this latter substance itself will still remain, and has to be removed by some other contrivance. As the simplest, and perhaps most economical, may be mentioned the use of sulphuric acid, (Croll's patent) the gas either before or after its entrance into the lime purifiers, is passed through dilute sulphuric acid, the ammonia remains behind in combination with the acid, forming a salt (sulphate of ammonia) which is exceedingly valuable as a manure, and has lately been strongly recommended for many horticultural purposes. The quantity of salt thus obtained is not inconsiderable, inasmuch as the gas contains about $\frac{1}{300}$th of ammonia. The gas is stated to be very much improved by the separation of ammonia in several respects; firstly, its illuminating power is increased 5 per cent; and secondly, its corrosive action on brass or copper, jets and pipes is materially diminished. Moreover, by the previous removal of the ammonia, the lime used in the purifiers does not acquire so disagreeable a smell as when not thus treated. Besides the foregoing patented process of Croll, there are numerous others for the removal of ammonia from coal gas, all depending upon bringing it into contact with some substance which may either combine directly with it, or else by a decomposition may effect its removal. For instance, bone dust dissolved in oil of vitriol is sometimes used, yielding a most valuable manure. Various acids, and even neutral salts, (for instance, the common green vitriol, or sulphate of iron) are recommended in Johnson's patent. Philippi and Mallet recommended salts of manganese, which can be obtained in large quantities from the residues in bleaching works. Croll uses sulphurous acid as a purifier, by which rather large quantities of sulphur are obtained; but in all these processes it is still necessary to employ either a wet or a dry lime purifier before the gas is rendered fit for use. The residue from the lime vats has a most detestable smell, and is scarcely to be recommended for agricultural purposes until it has either been roasted, or exposed for a length of time to the atmosphere.

An exceedingly curious and ingenious process has been patented by Mr. Laming by which the purification of the gas is effected by the chemical action of its own impurities on materials which do not require to be renewed at such short periods as is the case with lime. A solution of the chloride of iron is mixed with either lime or chalk, sawdust is then added, and thus a porous mass is prepared in which after exposure to the air, the principal and active ingredients are lime, peroxide of iron, and muriate of lime. The sulphuretted hydrogen is absorbed by the oxide of iron and sulphuret of iron formed, carbonate of lime is also produced, and according to Mr. Laming muriate of ammonia likewise, although the chemical process which effects this formation does not seem to be very clearly made out in his description.

The mixture absorbs the impurities very perfectly, and possesses this advantage, that on being exposed to the atmosphere it has no disagreeable smell, but becomes rapidly oxidized, the sulphuret of iron passing into sulphate, which salt is again decomposed by the chalk, (carbonate of lime) and thus the mixture of itself returns to its original condition, viz., peroxide of iron and chalk. After being used a number of times the salt of ammonia accumulates to such an extent as to impede its action, in that case it only needs to be washed well, in order to restore to the mixture its original efficacy.

(To be Continued.)

Remarks on Thermometric Registers; by Capt. J. H. Lefroy, R. A., F. R. S.

One of the first physical enquiries to which the attention of the occupants of a new country is naturally directed, seems to be, in almost every case, the Temperature of the Air; and this choice is justified, not only by the intimate personal concern we all have in that question, but also by the circumstance that the greater part of the other phenomena of the weather, that is, of meteorology in relation to the business of life, depend more or less immediately upon it. And there is a particular interest in all such observations as date from that great epoch in the physical history of a country, in which it first becomes the abode of civilized man. It then begins to undergo those superficial changes which his industry toils to effect. From such observations must be taken, at a future period, the data for a number of refined enquiries of the greatest interest. By reference to them we learn, or ought to learn, whether we can bring about changes of climate by human agency: whether such changes are always beneficial, and therefore in harmony with the design of the Universe: or sometimes noxious, and therefore in favour of the opinion that there are pre-ordained bounds to the extension of civilized man over the Globe: if we may credit Father Huc, the first result of the extension of Chinese industry into Independent Tartary, has been to render the country uninhabitable: may no such result follow the invasion of Canadian woods by British ploughs, but thus we learn that such a thing is within the bounds of possibility. Again, inseparably connected with the settlement of a country, is the gradual disappearance of whole classes of the

animal kingdom. The wolf, the bear, and the beaver have disappeared from Great Britain: the last public reference to the latter, as among the *feræ naturæ* of the British Isles is, as we learn from Mr. Daniel Wilson, in an act of King David I. of Scotland, A. D. 1124; less than a century will doubtless see the extinction of the same species, and some others in Canada; but that which British naturalists and geologists cannot now determine by direct evidence, namely, whether a corresponding change of climate has occurred, may be determined by our posterity if we will only take a little trouble in the matter. And let me not be met here by the old, but ingenious objection, that we are not bound to do anything for posterity since posterity does nothing for us. Posterity does something for us. With posterity lie the hopes and aspirations which are a part of the present rewards of life: it is the guardian of our dearest interests, and we can no more disconnect ourselves from the future than from the past. However, in our circumstances it is not altogether necessary to resort to this argument to justify a reference to the present imperfect state of observation in Canada with a view to its improvement. We have, so to speak, side by side, in this extensive country, the twelfth and nineteenth century. The rude beginnings of settlement, where man shares the soil with the wildest natives of the forest, and nothing has as yet occurred to affect the physical conditions of a state of nature; and the fully developed empire of his industry, where all the local changes likely to occur are already wrought out. Can there be no comparison made between these conditions? It is perfectly possible, but unfortunately the materials do not exist.

Let us suppose the admirable example of the States of New York, Ohio and Massachusetts, to be followed by the Canadian Legislature, or, as it may be, by the different District Councils, in the appropriation of a sufficient sum to supply each District Grammar School throughout the country with accurate meteorological instruments; and that a careful register is kept at each. There would then be about twenty points, in addition to those already existing, at which the mean temperature for every month of the year would in a few years be known, and they would be connected with a large number of stations in the States just named. Situated, as they would be, at various elevations above the sea, a correction would be requisite to reduce them to the same plane, and possibly, also, other corrections; but these applied, we should have a series of stations which ought to furnish, with great precision, the curves of equal monthly temperature, or the *isothermals*, as they are termed, of the respective months, in this region of the American continent. It would be not a little curious and interesting to see these lines when drawn on the map, varying their configuration, as they would probably do, if the observations were perfectly good, according to the character of the country through which they might pass. To see, for example, those belonging to the winter months bending to the north, and those belonging to the summer months bending to the south, when they emerged from an uncleared to pass through a well settled district; to see in like manner the lines connecting places having an equal annual fall of rain or snow, deflected from a symmetrical course by large areas of forest interpolated between thriving settlements and open spaces. What the singular discovery of the very thermometers used by Galileo, and their comparison with modern instruments, has *not* shown, because Italy has long ago attained its permanent climatic condition, namely, the effect of two centuries of improvement, might thus very possibly be disclosed to our view in a dozen years, nor could any one capable of the pleasure arising from the contemplation of natural laws and operations fail to derive it here. It would be easy, but is probably not necessary, to name other reasons why accurate observations of the thermometer would be highly valuable. I pass therefore, at once, to the question as to what is necessary to give observations this character.

Almost every house possesses a thermometer, in very many cases some sort of regular register is kept. A good many of these registers, sooner or later, get printed. Can anything more be required? Alas! a great deal; nine out of ten of all such amateur registers are not only worthless, but mischievous and deceptive, owing to the neglect of two simple precautions at the outset. First,—To get a good instrument: Secondly,—to establish it in a proper position.

1. *Of Thermometers.*—The common instruments purchased for five or ten shillings at hardware shops, are entirely unfit for our purpose, on the grounds of inaccuracy and want of sensibility. The best form of thermometer is one in which the bulb is cylindrical, or at least elongated, not globular, and blown extremely thin; each degree, at least, should be marked on the scale; in the best instruments the degrees are subdivided; the graduation for general Canadian use should extend from —30° to +110°: in Lower Canada it may occasionally be necessary to employ a thermometer graduated below —30°: mercury thermometers are preferable to those in which the fluid is alcohol, from the property which the metal possesses of varying in volume almost exactly in proportion to the variations of temperature, such is not the case with alcohol, which is also subject to chemical changes capable of affecting its volume. The expansion of these fluids between the freezing and boiling point of distilled water, the latter, under a barometric pressure of 29.992, (760 millimetres) is as follows:—

Mercury	$\frac{1}{55.50} = 0.018018$	Dulong and Petit.
"	$\frac{1}{55.08} = 0.018153$	Regneault.
Alcohol	$\frac{1}{9.0} = 0.111$	

the volume of each at the freezing point of water being taken as unity. The expansion of volume for one degree will be in proportion, according to the scale we employ, and from these values may be calculated the dimensions which the bulb of the thermometer must have to render expansions of any degree of minuteness, which may be required, visible in the tube. In making standard thermometers of the highest character, the first step is to select a piece of glass tube, and to introduce it into a very small quantity of mercury, filling about half an inch of its length. By blowing gently through a flexible tube, this portion of mercury is made to move onwards in successive steps each of its own length. Should there be any inequalities in the bore of the tube, as is usually the case, the same quantity of mercury will occupy sometimes a longer sometimes a shorter space; the exact space it occupies is measured with all the precision possible in each position, marked on the tube, and afterwards subdivided as much as may be necessary. The scale is thus divided according to *equal capacities of the bore*, a circumstance obviously essential to the accuracy of the instrument. A bulb being next blown on to the tube the thermometer is finished in the usual way. The next point is to determine the value of the divisions on the tube in terms of Fahrenheit's or any other scale. This is done by first immersing the instrument in a mixture of crushed ice with water, and noticing by the aid of a telescope, from a distance, the exact division at which the mercury stands; then suspending the instrument in a vessel of peculiar construction over boiling water, and noticing in the same way the division at which it stands when the air has been completely expelled from the vessel, and it is filled with steam whose elasticity is represented by the barometric pressure at the moment. The temperature of such steam reduced, if necessary, to the standard barometric pressure, is the physical constant which philosophers have agreed to refer to for the upper fixed point on the scale, that of freezing water being the lower fixed point; but there is a slight discrepancy in the data used in England and in other countries. The standard barometric pressure is 29,800 inches in England, measured on a brass scale having a temperature of 62°, and 29,922 inches in France, measured on a brass scale having a temperature of 32°:

the temperature of the mercury is supposed to be 32° in both cases. 29,800 inches at 62° is but 29,791 inches at 32°, there is consequently a real discrepancy of 0,131 inch between the standard barometric pressure in the two countries, and trifling as this quantity may appear to be, it makes the French boiling point nearly a quarter of a degree Fahrenheit higher than the English (0°.24), and like the use of different scales and measures, is one of the anomalies in science which it may be hoped will be removed at no distant day. Let us suppose then that the mercury in a thermometer, graduated as described, stands at 115.7 divisions in ice, and at 616.9 in steam of the standard elasticity. Then, if Fahrenheit's scale be adopted, we have 501.2 divisions to represent 180 degrees, whence each division =0°.2784 Fahrenheit, and the exact temperature corresponding to any division is known. The term *standard thermometer* is improperly applied to any instrument which does not extend from the freezing to the boiling point, and of which the perfect equality of the subdivision has not been established, it is however commonly applied to instruments on which unusual pains have been bestowed, and which have been compared with a true standard. Thermometers manufactured and sold by wholesale have not the slightest pretensions to this character. It is essential that every observer should verify for himself, at least the freezing point marked on the scale of his instrument, by immersing it in pounded ice and water, up to the division 32° on the scale. The best instruments will frequently deviate a little from the truth, owing to a change which the capacity of the bulb undergoes in course of time, the cause of which is still very obscure; an error of one or even two degrees is by no means extraordinary in common instruments. In Canada it is chiefly the graduation below the freezing point which the observer has to suspect, and it is desirable where a standard thermometer cannot be referred to for comparison, to test an instrument by immersing it in a mixture of 1 part common salt, 2 parts snow, thoroughly mixed together and stirred up in a deep cup, when it should sink to —4°; this temperature is however not absolutely constant like the others, but sufficiently so for a useful practical test in the absence of better means. The observer should not in these experiments trust to a single reading, but take a considerable number, with an interval of a minute between them. The cup itself may be placed in an exterior vessel filled with snow. Thermometers are not in general much in error at the summer temperatures.

(To be continued.)

On the Physical Lines of Magnetic Force; by Prof. Faraday.

On a former occasion, certain lines about a bar magnet were described and defined (being those which are depicted to the eye by the use of iron filings sprinkled in the neighbourhood of the magnet,) and were recommended as expressing accurately the nature, condition, direction, and amount of the force in any given region either within or outside of the bar. At that time the lines were considered in the abstract. Without departing from or unsettling anything then said, the enquiry is now entered upon of the possible and probable *physical existence* of such lines. Many powers act manifestly at a distance; their physical nature is incomprehensible to us: still we may learn much that is real and positive about them, and amongst other things something of the condition of the space between the body acting and that acted upon, or between the two mutually acting bodies. Such forces are presented to us by the phenomena of gravity, light, electricity, magnetism, &c. These when examined will be found to present remarkable differences in relation to their respective lines of forces; and at the same time that they establish the existence of real physical lines in some cases, will facilitate the consideration of the question as applied especially to magnetism. When two bodies, *a*, *b*, gravitate towards each other, the line in which they act is a straight line, for such is the line which either would follow if free to move. The attractive force is not altered, either in *direction* or *amount*, if a third body is made to act by gravitation or otherwise upon either or both of the first two. A balanced cylinder of brass gravitates to the earth with a weight exactly the same, whether it is left like a pendulum freely to hang towards it, or whether it is drawn aside by other attractions or by tension, whatever the amount of the latter may be. A new gravitating force may be exerted upon *a*, but that does not in the least affect the amount of power which it exerts towards *b*. We have no evidence that *time* enters in any way into the exercise of this power, whatever the distance between the acting bodies, as that from the sun to the earth, or from star to star. We can hardly conceive of this force in one particle by itself; it is when two or more are present that we comprehend it: yet in gaining this idea we perceive no difference in the character of the power in the different particles; all of the same kind are *equal*, *mutual*, and *alike*. In the case of gravitation, no effect which sustains the idea of an independent or physical line of force is presented to us; and as far as we at present know, the line of gravitation is merely an ideal line representing the direction in which the power is exerted. Take the sun in relation to another force which it exerts upon the earth, namely, its illuminating or warming power. In this case rays (which are lines of force) pass across the intermediate space; but then we may affect these lines by different media applied to them in their course. We may alter their direction either by reflection or refraction; we may make them pursue curved or angular courses. We may cut them off at their origin, and then search for and find them before they have attained their object. They have a relation to *time*, and occupy eight minutes in coming from the sun to the earth: so that they may exist independently either of their source or their final home, and have in fact a clear distinct physical existence. They are in extreme contrast with the lines of gravitating power in this respect; as they are almost in respect of their condition at their terminations. The two bodies terminating a line of gravitating force are alike in their actions in every respect, and so the line joining them has like relations in both directions. The two bodies at the terminals of a ray are utterly unlike in action; one is a source, the other a destroyer of the line; and the line itself has the relation of a stream flowing in one direction. In these two cases of gravity and radiation, the difference between an abstract and a physical line of force is immediately manifest. Turning to the case of static electricity we find here attractions (and other actions) at a distance, as in the former cases; but when we come to compare the attraction with that of gravity, very striking distinctions are presented which immediately affect the question of a physical line of force. In the first place, when we examine the bodies bounding or terminating the lines of attraction, we find them as before, mutually and equally concerned in the action; but they are not alike: on the contrary, though each is endued with a force which, speaking generally, is of the like nature, still they are in such contrast that their actions on a third body in a state like either of them are precisely the reverse of each other,—what the one attracts the other repels; and the force makes itself evident as one of those manifestation of power endued with a dual and antithetical condition. Now with all such dual powers, attraction cannot occur unless the two conditions of force are present and in face of each other through the lines of force. Another essential limitation is, that these two conditions must be exactly equal in amount, not merely to produce the effects of attraction, but in every other case; for it is impossible so to arrange things that there shall be present or be evolved more electric power of the one kind than the other. Another limitation is, that they must be in physical relation to each other; and that when a positive and a negative electrified surface are thus associated, we cannot cut

off this relation except by transferring the forces of these surfaces to equal amounts of the contrary forces provided elsewhere. Another limitation is, that the power is definite in amount. If a ball *a* be charged with 10 of positive electricity it may be made to act with that amount of power on another ball *b* charged with 10 of negative electricity; but if 5 of its power be taken up by a third ball *c* charged with negative electricity, then it can only act with 5 of power on ball *a*, and that ball must find or evolve 5 of positive power elsewhere: this is quite unlike what occurs with gravity, a power that presents us with nothing dual in its character. Finally, the electric force acts in curved lines. If a ball be electrified positively and insulated in the air, and a round metallic plate be placed about 12 or 15 inches off, facing it, and uninsulated, the latter will be found, by the necessity mentioned above, in a negative condition; but it is not negative only on the side facing the ball, but on the other or outer face also, as may be shown by a carrier applied there, or by a strip of gold or silver leaf hung against that outer face. Now, the power affecting this face does not pass through the uninsulated plate, for the thinnest gold leaf is able to stop the inductive action, but round the edges of the face and therefore acts in curved lines. All these points indicate the existence of physical lines of electric force:—the absolutely essential relation of positive and negative surfaces to each other, and their dependence on each other contrasted with the known mobility of the forces, admit of no other conclusion. The action also in curved lines must depend upon a physical line of force. And there is a third important character of the force leading to the same result, namely, its affection by media having different specific inductive capacities. When we pass to dynamic electricity, the evidence of physical lines of force is far more patent. A voltaic battery having its extremities connected by a conducting medium, has what has been expressly called a current of force running round the circuit, but this current is an axis of power having equal and contrary forces in opposite directions. It consists of lines of force which are compressed or expanded according to the transverse action of the conductor, which changes in direction with the form of the conductor, which are found in every part of the conduotor, and can be taken out from any place by channels properly appointed for the purpose; and nobody doubts that they are physical lines of force. Finally as regards a magnet, which is the object of the present discourse. A magnet presents a system of forces perfect in itself, and able, therefore, to exist by its own mutual relations. It has the dual and antithetic character belonging to both static and dynamic electricity; and this is made manifest by what are called its polarities, *i. e.* by the opposite powers of like kind found at and towards its extremities. These powers are found to be absolutely equal to each other; one cannot be changed in any degree as to amount without an equal change of the other; and this is true when the opposite polarities of a magnet are not related to each other, but to the polarities of other magnets. The polarities, or the *northness* and *southness* of a magnet, are not only related to each other, through or within the magnet itself, but they are also related externally to opposite polarities, (in the manner of static electric induction) or they cannot exist; and this external relation involves and necessitates an exactly equal amount of the new opposite polarities to which those of the magnet are related. So that if the force of a magnet *a* is related to that of another magnet *b*, it cannot act on a third magnet *c* without being taken off from *b*, to an amount proportional to its action on *c*. The lines of magnetic force are shown by the moving wire to exist both within and outside of the magnet; also they are shown to be closed curves passing in one part of their course through the magnet; and the amount of those within the magnet at its equator, is exactly equal in force to the amount in any section including the whole of those on the outside. The lines of force outside a magnet can be affected in their direction by the use of various media placed in their course. A magnet can in no way be procured having only one magnetism, or even the smallest excess of northness or southness one over the other. When the polarities of a magnet are not related externally to the forces of other magnets, then they are related to each other: *i. e.* the northness and southness of an isolated magnet are externally dependent on and sustained by each other. Now, all these facts, and many more, point to the existence of physical lines of force external to the magnets as well as within. They exist in curved as well as in straight lines; for if we conceive of an isolated straight bar magnet, or more especially of a round disc of steel magnetized regularly, so that its magnetic axis shall be in one diameter, it is evident that the polarities must be related to each other externally by curved lines of force; for no straight line can at the same time touch two points having northness and southness. Curved lines of force can, as I think, only consist of physical lines of force. The phenomena exhibited by the moving wire confirm the same conclusion. As the wire moves across the lines of force, a current of electricity passes or tends to pass through it, there being no such current before the wire is moved. The wire when quiescent has no such current, and when it moves it need not pass into places where the magnetic force is greater or less. It may travel in such a course that if a magnetic needle were carried through the same course, it would be entirely unaffected magnetically, *i. e.*, it would be a matter of absolute indifference to the needle whether it were moving or still. Matters may be so arranged that the wire when still shall have the same diamagnetic force as the medium surrounding the magnet, and so in no way cause disturbance of the lines of force passing through both; and yet when the wire moves, a current of electricity shall be generated in it. The mere fact of motion cannot have produced this current: there must have been a state or condition around the magnet and sustained by it, within the range of which the wire was placed; and this state shows the physical constitution of the lines of magnetic force. What this state is, or upon what it depends, cannot as yet be declared. It may depend upon the ether, as a ray of light does, and an association has already been shown between light and magnetism. It may depend upon a state of tension, or a state of vibration, or perhaps some other state analogous to the electric current, to which the magnetic forces are so intimately related. Whether it of necessity requires matter for its sustentation will depend upon what is understood by the term *matter*. If that is to be confined to ponderable or gravitating substances, then matter is not essential to the physical lines of magnetic force any more than to a ray of light or heat; but if in the assumption of an ether we admit it to be a species of matter, then the lines of force may depend upon some function of it. Experimentally, mere space is magnetic; but then the idea of such mere space must include that of the ether, when one is talking on that belief; or if hereafter any other conception of the state or condition of space rise up, it must be admitted into the view of that which, just now, in relation to experiment, is called mere space. On the other hand, it is, I think, an ascertained fact that ponderable matter is not essential to the existence of physical lines of magnetic force.—*Athenæum.*

Canada in 1852: Extract from Notes on Public Subjects, by Hugh Seymour Tremenheere.

Let any one who has considered these Provinces thus far now glance for a moment at their great and flourishing towns; Hamilton, beneath a bold escarpment and enfolding hills richly covered with the primeval forest; the undulating plain on which it stands diversified with foliage, cultivation and villas; the inlet from the Lake, which forms its harbor, presenting an agreeably varied outline; the villas generally in a thoroughly correct style of architecture, and surrounded by grounds as well kept and as neat

as art and care can make them; the streets wide, the houses substantial, the public buildings creditable, the shops and wholesale warehouses showing every sign of a thriving and exuberant trade. Toronto, spreading over a wide and gently rising plateau on the Lake shore, handsomely built, increasing most rapidly, possessing public buildings which in dimensions, in correctness of taste, and in solidity of construction, are surpassed by few of a similar kind in the second rate towns in England; its wealth steadily accumulating, under perhaps the comparatively slow but certain course of the strict business principles and mercantile honor of the "old country"; its numerous neat and well kept villas, and houses of larger pretensions attached to considerable farms at a further distance from the town, attesting the effect of the process. Kingston, also showing signs of prosperity and progress; distinguished, even among the towns in Canada, for the grandeur and correctness of design of its public buildings (market houses, public offices, &c.); occupying an important position at the head of the Rideau Canal; guarded by its strong fort, which combines in the landscape with the varied outline of the town, the inlet forming the small dockyard, the woody islands and the surrounding country. Montreal, alive with commerce, pleasing the eye with the graceful forms of the hills around; some of its old narrow and somewhat picturesque streets reminding one of Europe; its public buildings erected and in progress, equally substantial and creditable. Quebec, with its undying interest, its beauty of position and outline, its crowd of masts along its wharfs, its fleets at anchor below the citadel, or in the "Timber coves" beneath overhanging cliffs and foliage, its quaint old streets, its imposing fortifications, and its busy population.

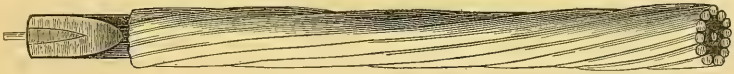
Let all these circumstances be weighed; the great natural resources of these provinces, the energy now at work in developing them, the inducements thereto held out by the home growth of a consuming population and by the expanding facilities of transport either to the home or to the foreign markets; and it will be seen how extensive a field is there opening for the still further employment of British Capital and labor.

* * * * * *

The respect and admiration I conceived for that splendid colony on seeing it from one end nearly to the other, were in no wise diminished by what I witnessed or heard of the French Canadian portion of it; nor were the anticipations of its future progress in any degree lessened. And should any one in this country be disposed to undervalue it, either in itself or as "part and parcel" of the British dominions, I would beg him to go and pass through the length and breadth of that favored and magnificent land. Let him picture to himself its thirty millions of acres of soil, than which finer and richer never came from the beneficent hand of nature; let him survey that splendid river, bearing to the ocean vessels that have navigated its parent water for two thousand miles; let him examine its Canals—those noble works of skill and science that have as it were smoothed the rapid and made a stepping stone of the rocky ridge that throws Niagara over its brow; let him walk through those towns on the margin of those lakes and that river—towns which wealth has already decorated, and which a sober and correct taste, and solid comfort and convenience, have already stamped with a thoroughly English character. Let him then look at the varied and in some parts picturesque scenery, either glowing in the hot summer's sun, or arrayed in the gorgeous tints of an American Autumn, or reposing under the bright and silent winter's sky. Let him see the many and various fruits of the earth pouring into those towns daily, as from the very lap of plenty. Let him think of the genuine English feeling, grounded on the participation of British freedom with the pride of British origin, which pervades the land; and the no less deep and elevated sentiments of French nationality, with which, in singular and beautiful union, a chivalrous loyalty to our Queen is mingled as the colors in a prism, distinct yet united. Let him see and consider these things, and then ask himself if that is a country of which to speak lightly, as one that may possibly be torn, or may one day fall away from the British Crown!

The Irish Submarine Telegraph.

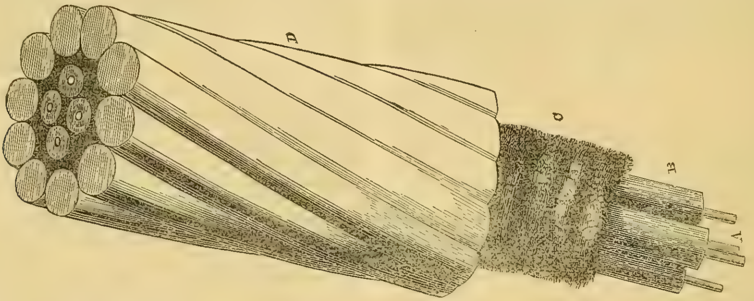
The success of the Electric Telegraph would have been greatly circumscribed, if means had not been found of passing the electro-current under water. Intelligence would have been transmitted swiftly over continents, and arrested by narrow channels. The instruments of perfecting important discoveries sometimes appear along with the invention. The electro current can be conveyed beneath water by the aid of gutta percha, and this singular material came into the western markets at the precise time when it was required to accomplish this work. The wires of the Electric Telegraph, when stretched on poles by the side of railways, according to the common practice in this country, are



independent of gutta percha; but when they are carried through tunnels, its aid is necessary. The aerial telegraph, although common in Britain, is not universally used. The subterranean system is chiefly practised in Germany. We suspend the wires on poles, and the Prussians cover them up in a trench. The idea of messages overtaking railway trains, passing them with inconceivable rapidity, and preparing for travellers an unwelcome reception at the end of their journey, has become a frequent subject of sentimental writing. It is not quite so startling as those underground messages transmitted with equal rapidity. As the train hurries over the line, the traveller has leave to imagine that his eye detects a slight tremulousness in neighbouring wires, although that is entirely imaginative; but, in the case of the subterranean telegraph, information of an evil deed seems to spring out of the earth. But the telegraph has other, more common, and more important purposes to serve, than that of a police assistant. It is not always charged with messages of evil. It carries all the more important missives of the age, and if it ever brings a tale of danger of war, it will as often convey the glad tidings of safety and of peace. Its operations and tendencies are all on the side of inter-national friendships and amity, for it utterly annihilates distance, in one respect, and will maintain yet hourly communications between the most distant regions of the earth. But deep, wide oceans intervene between them, and neither the English nor the German systems of telegraphing are practicable on them. Science had not material whereby to throw a bridge with poles and wires over the Atlantic, while the subterranean system seemed at least equally improbable. The latter, however, afforded suggestions for a subaqueous telegraph. The insulation and protection of the telegraph wires were requisite in the subterranean system, and were fully afforded by gutta percha. The wires had been covered by that strange gum, extracted from an eastern tree, and while this covering did not interfere with the transmission of messages, it effectually shielded the swift messenger on the journey, or perhaps we should describe it with

more propriety as the shield of the fragile highway on which that messenger travels. Even scientific men do not always perceive the more obvious facts connected with the matter on which they operate; and, in the first instance, subaqueous telegraphs were proposed of wire, coated with gutta percha alone. That material possesses great powers of resistance; but yet, placed beneath the ocean, sunk a hundred fathoms, or any other number of fathoms deep, and chafed against rocks, even the wrecks of vessels, or many other substances, it would fail. The wire coated with gutta percha was even, we believe, thrown over the British channel, but it did not maintain the communication for more than twenty-four hours. It was now clear that the gutta percha would protect the wires of the subaqueous telegraph, if it could be itself secured against the rough handling which all invading substances experience at times from the ocean. The latter object has been effected by galvanized wires twisted in a spiral form round the gutta percha case, in which a copper wire is enclosed. The telegraph across the channel to the French coast was put down in the month of September last. It has now been in operation from ten to eleven months, and the insulation of the wire is so complete that the communication has been steadily maintained. In June last, a telegraph line was thrown over the Irish channel from Holyhead to Howth. The distance between these points is full sixty miles, and the coast on both sides "rocky and rough." The agitation in favour of an Irish Atlantic steam-packet port caused considerable excitement on telegraphic matters. Wires could easily be suspended from Dublin to Galway along the line of railway; and the difficulties of the channel once overcome, intelligence received on the west coast of Ireland might be transmitted to London with great rapidity. The absolute transmission, if the line were not broken by intervening stations, can scarcely be measured by time. The messenger would not require a second on the way over the wild Irish bogs, which are to be converted into gold, and over the wilder fertile lands of that country, which require no such conversion; for they are already more valuable than gold itself—down beneath that deep and often stormy channel—past the busy towns of the north-west of England, and over all the breadth of the land from Holyhead to Lothbury or Charing-cross. The Irish telegraph would be formed,—that fact was unquestionable after the completion of the French line. Rival companies were, therefore, anxious for the work, and those who carried over the first intelligence were likely to be successful in preserving the business.

The channel between Holyhead and Howth is over sixty miles in breadth, and Howth itself is at a considerable distance from Dublin. The cost of prepared wires must be very heavy; and where a choice can be readily obtained, the narrow crossing of any channel will probably be adopted. The crossing between Portpatrick on the Scottish coast, and Donaghadee in the neighbourhood of Belfast, is not much over twenty miles. The channel is narrowed to little more than ten miles between the western corner of Argyleshire and the eastern extemity of Antrim; but the telegraphic wire would have to be carrried by land for many miles from Glasgow to the point nearest to Ireland on the Argyleshire coast, and again on the Irish coast towards Belfast for a shorter distance, but still one more considerable than from Donaghadee. A company was therefore formed to connect the British and Irish coast from Portpatrick. They have adopted the subterrraneous system from Dumfries onwards through a great breadth of country, forming the south-western shoulder of Scotland onwards to the coast. Upon the Irish shore the Belfast and County Down Railway does not come within ten miles of Donaghadee, and for that distance the railway will render no aid to the telegraph. These operations necessarily occupied considerable time, and, although now completed, yet other parties, by a decided step, telegraphed the wider channel between Holyhead and Howth, while the northern company were digging trenches. One day a gentleman called at the Gutta Percha Company's works, in London, and inquired if they could supply him with one wire, double covered with gutta percha, and eighty miles long, within two weeks. The question was somewhat startling, for the order, taken in connexion with the time for its performance, was out of the common line of business. It was however, accepted, and it was accomplished. Of course the company cover telegraphic wires with gutta percha as part of their business, while their customer probably wished to keep his own secret, and so their department was completed, and the work for some time, and re-covered at works in Newcastle on Tyne, with galvanized wires, before they were made acquainted with its destination. This was the first telegraphic wire which crossed the Irish channel and it wrought well for some time. We have learned, however, that it has been broken, and is irreparable. The report has caused considerable anxiety among commercial men in reference to sub-marine telegraphs; but the circumstances show nothing against them. Even if wires of the description employed should be altogether unsuccessful, the communications will still be formed and maintained. The first engraving shows accurately the form and size of the wire from Holyhead to Howth.



The telegraph wire is insulated within a double covering of gutta percha, and the latter is protected by twelve very small galvanised wires twisted around it in a spiral form. The rope is only of the thickness represented in the engraving, and has a fragile or rather weak appearance for the rough kind of work between Holyhead and Howth.

The villagers of Donaghadee and Portpatrick had long been interested in the intercourse between the two islands. Neither of these places had a natural harbour. The shelter afforded by them for shipping had been almost entirely cut out of rocks. The current in their great ferry resembled "a mill race." The water seemed ever to be in haste to get in, or else to get out and away

again, between the narrow points of land where Scotland and Ireland struggle to meet. Immense sums of money, which we should not like to count over, have been expended on this passage, for the benefit of Donaghadee, and Portpatrick in particular, and the world at large, in a more general way. When railways and steam navigation changed this "ferry" a few years ago, the villagers on both sides considered themselves very badly used indeed, by science. They offer a practical example of the propriety of people trusting to the "march of improvement," and waiting on. Another stage promised to restore and secure the more interesting part of the communications between the countries to its old channel. The two villages were to link together—not only two islands—but the eastern and western divisions of the earth. Then, with this renewal of their hopes, came the Holyhead and Howth competition to destroy them. Now, however, the reported destruction of the rival communicating wire has given new confidence to Donaghadee and Portpatrick, and the wiser class of persons in the two quiet villages say that people cannot expect profitably to cross the plans of nature—one of these plans being decidedly in their favour.

A more important section of the community express fears that the submarine lines of communication will always be liable to stoppages, and, from the destruction of wires, will become unreasonably expensive. Neither party have any ground for the opinions of the one, or fears of the other, in any event which has yet occurred. The second engraving, when contrasted with the first, will convey a better idea of what the Holyhead wire should have been, what the Dover one is, and the Donaghadee one, as we believe, will be, than any statement of the differences between them which we could make.

The telegraph in this instance consists of four wires. Each wire is separately insulated in a double covering of gutta percha. The double coating has been adopted to prevent the probability of imperfections in the material. The scheme completely obviates that risk; for it is highly improbable that the deficiency would occur in both coverings at the same point. The four wires, distinguished by the letter A in the engraving, being insulated by the gutta percha B, are not brought into contact with the protecting wires; but are wrapped up with spun yarn, saturated in tar, which protects them from the galvanized wires D. Ten of these wires, of considerable strength and thickness, are twisted round the tarred yarn, which covers the gutta percha in which the four conducting copper wires have been insulated. The adoption of the spun yarn as a covering or shield to the gutta percha, prevents the possibility of accident, from the latter being chafed by the wires. The probability of that accident is not great, but still it exists. We have seen part of a telegraphic wire absolutely twisted into the shape of a knot, while still the gutta percha, faithful to its important trust, maintained perfect the insulation of the copper wire. The galvanized wires in the rope which has maintained the communication with the French coast for the past ten months are very strong; and while the weight of the first specimen was only one ton per mile, the weight of the specimen on that station in actual use, is fully seven tons per mile.

The differences between the two telegraphs are thus apparent. The successful telegraph contains four wires, each doubly covered with gutta percha, wrapped in yarn carefully tarred and twisted round with ten thick galvanized wires, forming a rope of $1\frac{1}{2}$ inches of diameter, and weighing over seven tons per mile. The unsuccessful telegraph contains only one wire, also doubly covered with gutta percha, but not wrapped in yarn, and with its covering of twelve thin galvanized wires, not more than $\frac{1}{2}$ inch in diameter, and one ton per mile of weight.

The galvanized wires are unnecessary as a protection of gutta percha against the influence of ocean water; for we have seen very thin gutta percha netting immersed for five years in brine, but still as firm and tough as on the day of its manufacture. It is doubtful whether the material be not improved by the process.

We have heard that some extensive coils of telegraphic wire, in the form of the second illustration—the successful wire—have been ordered, and are now in preparation at the Gutta Percha Company's Works.

We infer, therefore, that we shall soon hear of more submarine telegraphs. When ten or twenty years have come and gone, a net-work of telegraphing will be laid under many seas, and carried over many lands. Intelligence will pass from nation to nation "quick as the lightning flash." This apparently feeble agency will help to break the barriers which separate mankind. And while it is evolving great benefits to commerce, the instrument which has rendered "subaqueous telegraphing" practicable should not be forgotten. The "savages," we are told, who gather this gum in the forests of oriental isles, and make it up in blocks for the market, put stones and other useless substances into these masses of professed gum, to increase their weight. The civilized are astonished that the "savages" should have learned to cheat. And yet the vice is natural. Kelp-burners sometimes try the same means of money-making. A kelp-owner told us that he was greatly distressed on the subject of Irish kelp, because it contained stones. Cheating is even practised among civilized persons. But if the "savages" are guilty of dishonesty in their gum-gathering, as their help in making submarine telegraphs is indispensable, an effort should be made to bring them out of their savage state. Their gutta percha has been a useful discovery to Europeans, who should try to make its discovery still more useful to the "savages."—*Expositor.*

South Wales Railway.

The South Wales Railway bids fair to become one of the great arteries of communication between London and several of the most important countries of the globe.

The terminus, at the best and safest harbour of the kingdom, Milford Haven, has already led to the formation of a company for constructing a class of steam vessels of a size, hitherto deemed impossible. The Eastern Navigation Company, guided by their scientific engineer, Mr. Brunel, we understand, contemplate vessels of 500 feet in length, and of a proportionate power, which will perform the voyage from Milford, *viâ* the Cape, to India in less time than is at present occupied by the overland mail. Other companies contemplate making their port at Milford, which is the most westerly harbour in the kingdom.

Hitherto an unfortunate break occurred at Chepstow, where passengers had to be conveyed about two miles over a rough country from station to station. On the 19th July this hiatus was abolished by the opening of the stupendous iron Bridge over the River Wye for public traffic; and we may now anticipate that the rich minerals of South Wales—its coals of every available description for steaming and household purposes—will be found in all the midland and London markets.

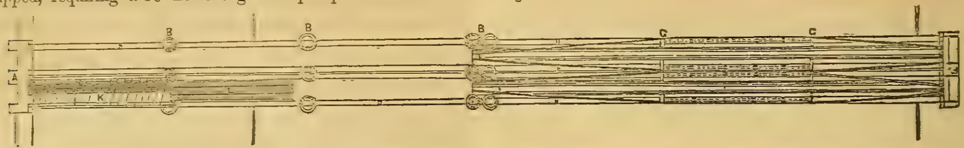
The railway having to cross a rapid navigable river without interruption to vessels, the Admiralty very properly required that the span over the mid channel should not be less than 300 feet; and that a clear headway of 50 feet above the highest known tide should be given. Bridges of this size are so rare that we propose to illustrate the present one in detail. These works require the highest effort of mechanical and constructive skill. Mr. Stephenson's magnificent Britannia bridge displays one

method of crossing wide spans. The present work of Mr. Brunel's is another mode, and shows, as might have been expected, his peculiarly original and bold conception, accompanied by extraordinary economy, by arranging his materials in the form of a large suspended truss, and attaching the roadway to suspension chains kept in a state of rigidity by vertical trusses or struts inserted between the chains, and a circular wrought-iron tube, spanning the river, 309 feet in length.

The bridge is 600 feet long: there are three spans over the land of 100 feet each, which are supported upon cast-iron cylinders, 6 feet in diameter and $1\frac{1}{4}$ inch thick. These cylinders were sunk to an average depth of 48 feet, through numerous beds of clay, quicksand, marl, &c., to the solid limestone rock, which was found to dip at an angle of 45 degrees; it had, therefore, to be carefully levelled horizontally, and the cylinders bedded level. These cylinders were sunk by excavating within them, and pressing them down by heavy weights; in doing which very great difficulties were overcome—immense volumes of fresh water were tapped, requiring a 30 horse engine to pump them out. The quantity very much increased during high water, which rises 44 feet, and in many of the cylinders work had to be suspended until the tide receded. Although the Wye is a tidal river, and therefore salt, no salt water was found in these sinkings. Again, dangers arose from sudden and extensive irruptions of soft river silt, often bursting in with such rapidity that the men had hardly time to escape. Some of the strata were found covered with immense conglomerate boulders, indicating a former river bed. These having been overcome, the cylinders were filled with concrete, composed of Portland cement, sand and gravel, which set in a few days as hard as rock. The concrete is filled up to the level of the roadway, so that, should a cylinder decay, it might be taken out and replaced in sections in safety.

There are six cylinders at the west end of the main span; upon those, a standard or tower of cast-iron plates, fifty feet high, is erected. A similar tower of masonry is built at the east end, upon the edge of the rocky precipice of the Wye. Each roadway being perfectly separate, we will describe that which is now opened.

Fig. 1.



In the annexed diagram, (Fig. 2) the cylinders are B; the standard (E E E) having openings to admit the train to pass. On the west standard is a cross girder of wrought-iron (N) upon which the tubes (I) rest. The tube serves to keep apart and steady the towers; and to the ends of the tube are attached the suspending chains. Now, in an ordinary suspension bridge, the chains hang in a festoon, and are free to move, according to the limited weights passing under them; but this flexibility would be inadmissible in a railway bridge, and the continuity of the rail would be destroyed if a very small deflexion took place when passed over by a heavy locomotive. With a view to give this necessary rigidity, Mr. Brunel has introduced at every third part of the tube a stiff wrought-iron girder, connecting firmly the tube to the roadway girders; and, with the aid of other adjusting screws, the suspension chains are pulled or stretched as nearly straight as desirable. Other diagonal chains connect these points, so that at whatever part of the Bridge an engine may be passing its weight is distributed all over the tube and chains by these arrangements.

The tube is laid upon the iron standards, but is free to move upon rollers at the top of the masonry standard. The expansion on the hottest day yet experienced has not exceeded one inch.

The tube is strengthened within by the introduction of diaphragms or discs at every 30 feet, which renders it both light and stiff.

The roadway girders (D) are formed of a deep thin plate of iron, stiffened at intervals. At the top it has a strong triangular cell to resist compression, and at the bottom a double plate of riveted iron to resist extension.

Between these side road girders are small cross girders (K) (Fig. 1) riveted to them diagonally. Upon the cross girders 4 inch creosoted planks are secured in the contrary diagonal direction (L), so that by crossing each other stiffness is produced. Eighteen inches of gravel are laid over all, and then the ordinary permanent way upon longitudinal sleepers.

The land abutment (A) is built of masonry. In the plan the letters B indicate the supporting cylinder; E E are the tubes; H H the chains radiating from the ends of the tube, which is 9 feet in diameter, to the saddle links on the sides of the roadway at G, where the width is 14 feet.

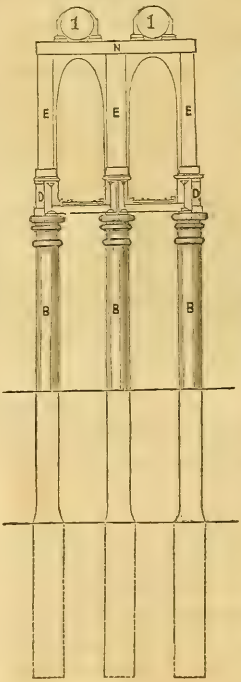


Fig. 2.

The second tube is now complete, and may be seen in the yard near the Bridge: it is expected to be floated next month. The pontoons for carrying one end of the second tube across the river are economically formed of six ordinary iron canal boats, three being placed bottom upwards upon the lower three.

The other end of the tube will be conveyed upon a railway formed upon piles, extending from the land to the six river cylinders; so that while the pontoons are pulled across by powerful tackle at one end, the latter end will be on a carriage rolling upon the railway to its place. Strong temporary erections of timber are constructed upon each side of the river to lift the second tube. We must not omit to mention that the elaborate drawings, instructions, and calculations, connected with this laborious work, were made under Mr. Brunel, by his principal assistant in London, Mr. Robert P. Brereton. The resident engineer of the line of the bridge is Mr. William George Owen, assisted by Messrs. Dibbin and Sayers.

The contractors for the iron-work are Messrs. Finch & Willey, of Windsor Foundry, Liverpool; for the masonry, Mr. Sharpe.

Annexed is a summary of the cast and wrought iron used in the bridge:—

	Tons.	cwts.	qrs.
Wrought iron, in three spans of 100 feet each, double line	277	0	0
Wrought iron in the girders, floor-bearers, and other work of the main span of 300 feet, double line	278	6	1
Two wrought iron tubes, each 312 feet long	302	11	0
Wrought iron beam on the standard to support the tubes	20	5	0
Vertical trusses	37	0	1
Tie girders to connect the caps of columns	1	10	0
Suspending links in main chains and diagonals	256	5	2
Saddles at points of suspension rollers	41	10	1
Adjusting screws	2	10	0
Rollers of main tube	7	17	3
Rollers of girders	2	11	3
Bolts	3	15	0
Total wrought iron	1231	2	2

	Tons.	cwts.	qrs.
Cast iron bed-plates for trusses	24	6	1
" standard	128	6	0
" caps for columns and parapets	21	0	0
" cylinders in the supporting piers	830	0	0
Total cast iron	1003	12	1

	Tons.	cwts.	qrs.	
Wrought iron	1231	2	3	2234 14 4
Cast iron	1003	12	1	

Masonry in abutment and pier, 3240 cubic yards.

Total estimated cost of the Bridge when entirely completed, £65,420.

The Bridge has been visited by a great number of engineers from the Continent and the East Indies; indeed, it is only by a personal inspection that the numerous ingenious arrangements can be understood.

The whole seems, when finished, to be very simple; yet engineers will fully enter into the complexity of the design, and the minute and carefully proportioned scantlings given to every part. We would specially call their attention to the cast-iron ring or circle attached to the ends of the tube to prevent collapse; to the wedges introduced under the vertical trusses to adjust the exact tension upon the chain; to the curve given to the tubes themselves, increasing their strength; and to the roller-boxes under the vertical trusses, by which means the road girders are maintained in a position to expand or contract independently of the movements of the main tubes.

The private trial of the Bridge took place on Wednesday, the 14th instant, and was described in our Journal of last week. The public opening of the Bridge took place on Monday last, the 19th. The first train that passed over was the six o'clock train from Swansea. To show the public utility of this great work, it may be mentioned that two years ago the journey from London to Swansea, partly by railway and partly by coach, crossing by a ferry-boat the dangerous passage of the Severn at Beachley, occupied 15 hours. The express trains are now timed to perform the same distance (216 miles) with ease and comfort in five hours.—*Illustrated London News.*

Portable Lifting Machine.

PORTABLE LIFTING MACHINE.—SCALE, ONE-FOURTH.

Fig 1.

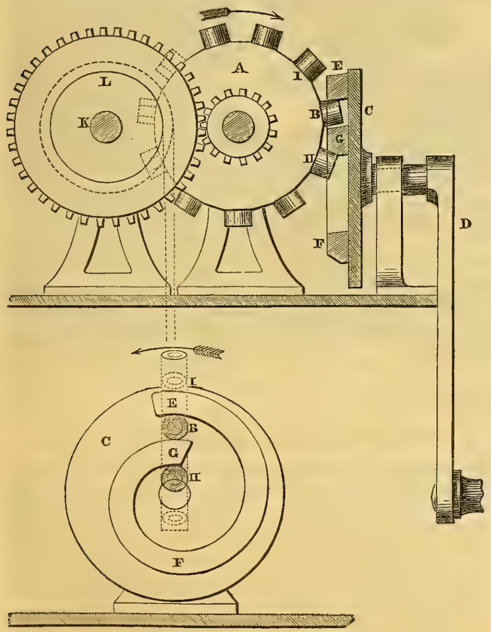


Fig 2.

The object of this machine, which is the invention of Mr. Long, hydrometer maker, London, is to obtain, in a portable and simple form, the means of multiplying the power of a man to a very great extent, for the purpose of lifting weights, &c., without the drawback of heavy friction and wear to which some lifting machines are liable, such as those in which an endless screw works into a toothed wheel. The construction is shown in the annexed engravings, figs 1 and 2. A, is a wheel on which eleven pins B H I, are fixed in the form of teeth, with a friction roller fitted upon each pin. The circular plate C C, is fixed at right angles to this wheel, upon the shaft of the winch D, to which the manual power is applied. On this plate is cast the spiral projecting piece E F G, which makes rather more than one turn upon the plate. This spiral is engaged with the pins B H, on the first wheel, and the difference in the amount of eccentricity of the two ends of the spiral is equal to the pitch or distance between the pins; so that when the plate C, and spiral are turned round one revolution by the handle, the wheel A, is driven round the distance of one pin or tooth.

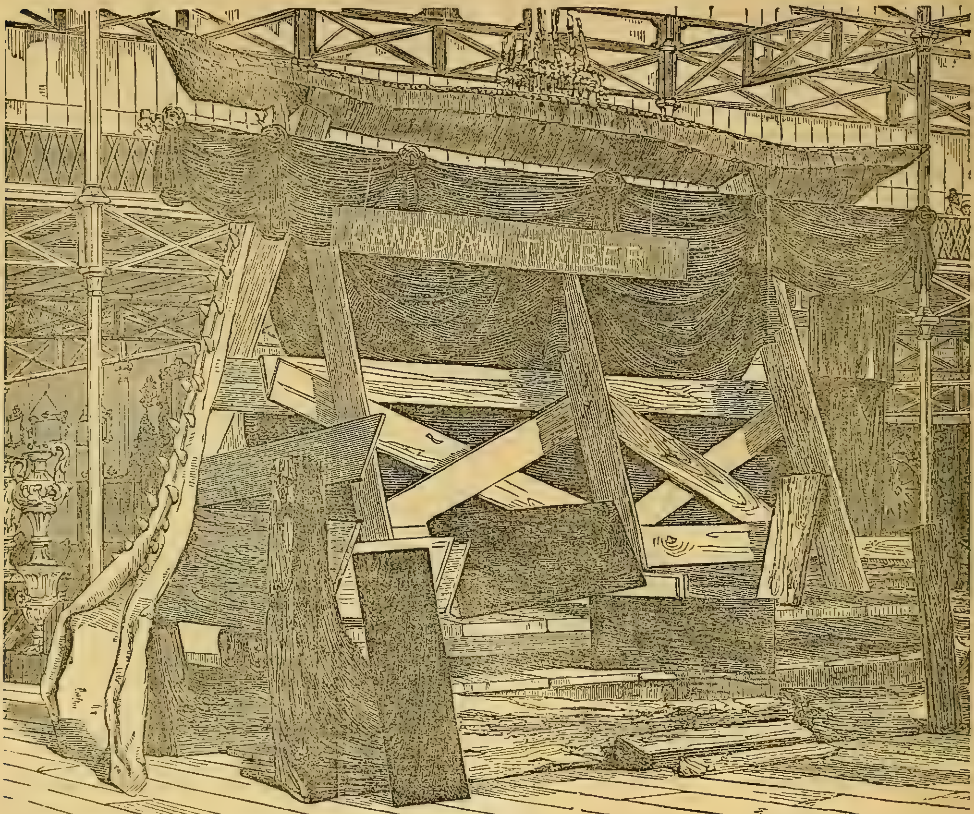
The driving face of the spiral has a varying bevil, adjusted so as to bear fairly and uniformly upon each pin in succession throughout the entire revolution, as the pin varies its inclination from B to H; the next pin above, I, being then brought down into the position B. The thickness of the spiral, as shown at G nearly fills the space between the two pins at all times, preventing any slip, and the upper pin is engaged a short distance before the lower one is released. The friction roller upon the pin turns round during the motion, rolling, with little friction, along the inner surface of the spiral, which forms an inclined plane, with an inclination of about 1 in 7.

A pinion fixed on the wheel A, is geared into one of three times the diameter on the third shaft, K, upon which is fixed the drum L, for winding up the rope or chain attached to the weight to be lifted. The leverage of the spiral and first wheel being 11 to 1, and that of the spur gearing 3 to 11, makes a power of 33 to 1, and the radius of the winch-handle and of the drum being 6 to 1, the total increase of power obtained by the machine is 200 to 1 nearly; or one man exerting a power of $\frac{1}{2}$-cwt. at the winch could lift five tons, including the friction.

This machine has the advantage of reducing the friction, in

consequence of the rubbing action being confined to the revolving of the friction rollers upon their axles, instead of the inclined plane rubbing upon the pins, or the thread of an endless screw rubbing upon the teeth of a worm-wheel, which has only contact at a little more than a line. This has a scraping action, tending constantly to remove the oil from the surface, but in the friction rollers there is a much larger surface in contact to bear the pressure, and this surface being always in contact never has the oil scraped off the surface, and can retain the oil for a much longer time.—*Civil Engineer and Architects Journal.*

Canada at the Great Exhibition.



CANADIAN TIMBER TROPHY.

(*Extract from the Official Reports published by the Imperial Commissioners of the Great Exhibition of* 1851.)

Of all the British Colonies, Canada is that whose exhibition is the most interesting and the most complete, and one may even say that it is superior, so far as the mineral kingdom is concerned, to all countries that have forwarded their products to the Exhibition. This arises from the fact that the collection has been made in a systematic manner, and it results that the study of it furnishes the means of appreciating at once the geological structure and the mineral resources of Canada. It is to Mr. W. E. Logan, one of the members of the Jury, who fills the office of Geological Surveyor of Canada, that we are indebted for this collection; and its value arises from the fact, that he has selected on the spot most of the specimens that have been sent to the Exhibition, and has arranged them since their arrival in London. The arrangement that he has adopted, which is entirely technical, includes eight divisions, viz:—Metalliferous minerals, and metals obtained from them; Minerals which require complicated operations to render them fit for use; Lithographic limestones and minerals employed in jewelery, and in the manufacture of glass of various kinds; Various kinds of clays and refractory sandstones; Rocks furnishing whetstones, hones, and polishing stones; Rocks and minerals in use for improving soils; Materials used in construction, and rocks serving for architectural decoration; Combustible minerals. All these classes include materials, of great interest, for industrial purposes, and we think it useful to mention some more specially. The ores of iron require notice first of all for their abundance and excellent quality, as the mag-

netic oxide is worked in upwards of ten different localities. The mines of Marmora, the most important of all, are situated in the west of Canada, and are worked in a mass of ore more than 100 feet thick. The magnetic ores obtained from them are accompanied by pig iron from the works established on the spot, and belonging to the Marmora Iron Company. The Jury has recognized the good quality of their products by making honourable mention of this Company; and the same is awarded to Dr. J. Wilson who has exhibited magnetic iron ores from South Sherbrooke, and phosphate of lime from Burgess. Ordinary mention has also been made of Mr. Lancaster of Vaudreuil, Captain Morin of St. Vallier, Messrs. L. Seer of Eustache, E. Caron of St. Ann, Montmorency, G. Duberger of Murray Bay, and R. W. Kelly of Gaspé, who have exhibited ores of iron and iron ochres of different kinds. Massive hydrous oxide of iron is an important mineral amongst the iron ores of Canada, and is workable in large masses in several localities. We may mention, particularly, that of St. Maurice, which for more than half a century has supplied the iron works and founderies of that name. The Honourable J. Ferrier, the proprietor of the mines, whose products are exhibited in No. 5, has added to the ores, specimens of pig and other iron, besides slags and ashes obtained during the working of the ores. The iron from St. Maurice is of good quality, and the products exhibited show that the establishment proceeds with regularity, in a metallurgical point of view; these considerations have induced the Jury to award a Prize Medal to the proprietor. The exhibition of Canada includes the ores of zinc, lead and copper, from several localities. The ores of copper from Lake Superior and Lake Huron are remarkable for their richness, and that called "Bruce Mine" on Lake Huron has been worked for some years. The Mining Company of Montreal (the proprietors of this mine,) have erected an establishment for working the ores on the spot, according to the methods adopted at Swansea, and the objects sent by this Company exhibit by the side of the ores the various products of smelting, besides the specimens of black and refined copper. Specimens of copper and native silver, from the Island of St. Ignatius, on Lake Superior, are added to these, and the Jury has awarded to the Company a Prize Medal for these various objects. The existence of sprangles and pepites of gold have been proved by actual investigation, in several rivers in the East of Canada, and honourable mention is made of the Chaudière Mining Company who exhibit pepites of native gold collected in the washing of those streams. Messrs. Bodin & Lebert are also rewarded with a mention for the white quartzose sands which they exhibit, which are used with advantage in the manufacture of flint and crown glass. The last award that we have to mention in the case of Canada is the honourable mention adjudged to Mr. Logan who has exhibited iron ores, lithographic stones, minerals, and various rocks. Our colleague has not thought it right to add to these the geological map he has made of Canada, a matter which the Jury greatly regret, not because they would then have been able to adjudge a higher reward for this beautiful work,—for the position of Mr. Logan, as member of the Jury, would render this impossible,—but because of the great interest it would have added to the Canada Exhibition. The lithographic stones exhibited by Mr. Logan belong to a palæozoic rock, occurring at Marmora, where the magnetic iron ore has been mentioned as forming a deposit of enormous thickness. These stones are remarkably homogenous, and fine grained; the degree of finish of the drawings that Mr. Logan has caused to be made upon them giving every promise of the quality being good. The geological position of the stones is interesting, and the reporter is not aware of such material having been previously found in the old rocks, since up to the present time those who practice lithography seek for stones from rocks of the oolitic series. The discovery of Mr. Logan proving that the palæozoic rocks may also furnish good lithographic stones, increases the resources available for this important branch of engraving and drawing. We must also notice, amongst the articles exhibited by Mr. Logan, a cast of the footsteps of an animal discovered in one of the argillaceous schists of the palæozoic period. When the schists were first laid bare to a certain extent, Mr. Logan observed the impression of footsteps repeated several times, and he had the upper bed removed to satisfy himself as to whether they were confined. Their existence, under these circumstances, fully proves that the markings were made at the time of deposit of the bed, and thus carries back the existence of the quadrupedal animal to the earliest silurian epoch. The length of the track discovered was eight feet, and as many as twenty impressions of each foot are traceable. Besides these is an impression between the footmarks, which may be regarded as the trail either of the abdomen or the tail of the animal. It would carry us beyond the proper limits of this report if we were to give even a sketch of the geology of Canada, and those who wish to become acquainted with the subject, must be referred to the report addressed by Mr. Logan to the Governor General of Canada, and published by order of the Legislative Assembly of the colony. We must, however, mention the presence of phosphate of lime and gypsum; the former disseminated in large prismatic crystals in the metamorphic limestones occurring in thick beds at Burgess, while the gypsum is found in many localities forming large irregular masses, intercalated in the upper members of silurian series, especially at Oneida Seneca, on the Grand river. This gypsum has an even fracture, is foliaceous, and a fine white colour, and being very pure, may be used for the manufacture of plaster for casting.

AGRICULTURAL ENGINEERING, &c.

Reaping Machines.—At the dinner following the recent show of the Royal Agricultural Society of England at Lewes (where no fewer than 17 varieties of the reaping machine were exhibited,) Mr. Thompson, the chairman of the York and North Midland Railway, and a great agricultural improver in the north of England, remarked, in the course of his speech: 'Nearly twenty years ago I saw a reaping machine at work in Scotland, which did its work fairly; and, so far back as 1816, a machine was constructed in the north of England, not very dissimilar in appearance to the present machines, the maker of which, not being patronised here, emigrated to America.' Of this ingenious Yorkshire mechanic, this is the first time we have heard; but by common consent the chief merit is assigned to the invention of the Rev. Patrick Bell, now minister of the parish of Carmyllie in Forfarshire. It was produced in 1826, the cutting operation being effected by a series of scissor blades, so working, that, when pushed along a corn field, it cut down the grain as if done by hand, but more cheaply and expeditiously. The Highland Society, upon the report of a committee, awarded the Rev. Mr. Bell a premium of £50 for his invention. Mr. Bell of Inchmichael, the brother of the inventor, adopted and improved the machine, employing it to reap his crops at the expense of only 3s. 6d. the imperial acre. Several others have at different periods been in operation in Forfarshire; but no attempt seems to have been made to introduce them generally over the country. In accounting for this apparent neglect of an important auxiliary to the farmer, Mr. Thompson (whom we have quoted above) alleges, that as the machine did not save the crop with sufficient care, and as at that time the abridgement of manual labour was of less value than it is now, from emigration and other causes, it was not encouraged as in other circumstances it would have been. It is known that several of the machines were sent from Dundee to America in 1831 and 1832, and probably became the models of the American reapers. Indeed, in the opinion of competent judges, there is the closest possible resemblance between Hussey's and Bell's machines,

Usher's Steam Plough.*

This invention consists, first, in mounting a series of ploughs in the same plane around an axis, so that the ploughs shall successively come into action; and, secondly, in applying power to give rotary motion to a series of ploughs or other instruments for tilling the earth, so that the resistance of the earth to the ploughs or instruments, as they enter and travel through the earth, shall cause the machine to be propelled: thus making the ploughs act in the earth in the same way as paddle-wheels do in

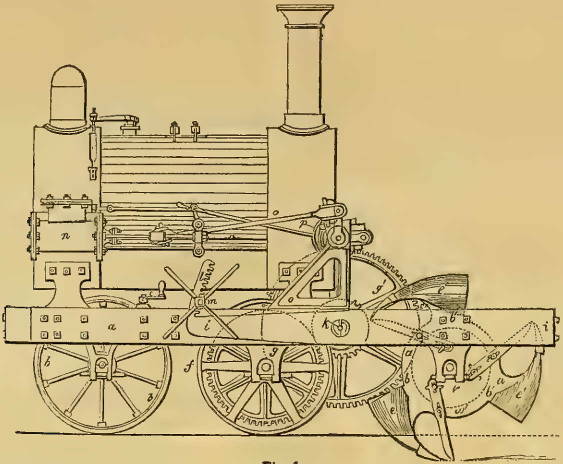


Fig. 1.

the water, by which the vessel is moved along; and the resistance of the earth being greater than the water, the power obtained is proportionably more.

Fig. 1 shows a side elevation of the steam machinery; fig. 2 is a plan thereof, the steam-boiler and engine being removed. In fig. 2 the under edge of the mouldboard and share is formed

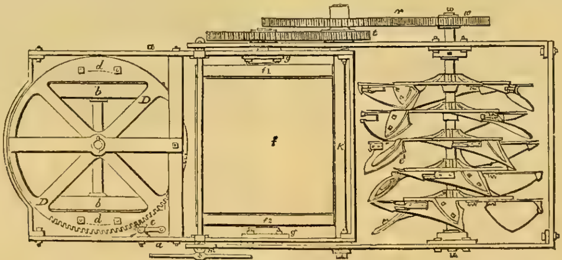


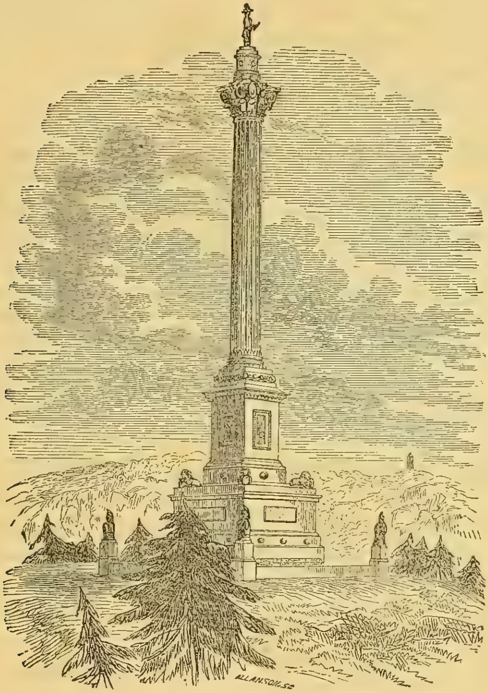
Fig. 2.

to a curve struck from the centre of the shaft, or axis, on which the ploughs are affixed; *a a* indicate the bed-frame, or carriage of the machine. The fore carriage wheels *(b b)* are mounted on an axle, which turns in bearings *(c)* attached to the swivel frame (D), which moves on the bolts *(d)* for turning the machine round in a small space. A portion of the swivel frame (D) is toothed, and acted upon by the pinion and winch *(e)*. The hind part of the carriage is here shown, supported upon the hollow cylinder or roller *(f)*, composed of two extreme parts *(f^1 and f^2)*, which are wheels similar to *b b*, the intermediate part *(f)* being by preference removable at pleasure, so as to render these bearing parts suitable to different stages of cultivation. This compound cylinder has its axle supported in the bearings *(g)* attached to the lower or to the under side of the carriage frame. The axle of this cylinder carries also at one end the wheel, *h*, to be afterwards noticed. A movable lever frame *(i i i i)* is supported on an axle or shaft (*k*) as a fulcrum. The free ends (*i' i'*) are formed into the toothed segments (*l*), and are concentric to *k;* these segments being acted upon by the two toothed pinions and spindles (*m*), which elevates or depresses the hind part (*i i*) of the lever frame, and all that it carries, at the pleasure of the conductor. On the carriage thus constructed is placed the locomotive boiler, with its engines, the power of which is applied through the medium of connecting-rods (*o*) to the crank-shaft (*p*), supported on two standards (*q*). On the shaft (*p*) there is also fixed the spur pinion, indicated by the dotted circle, *p' p'*, in fig. 1; and this pinion, by taking into the wheel, *r*, mounted on the shaft, *k*, gives motion, at the same time, to the pinion, *t*, which is carried round on the same shaft (*k*). The pinion, *t*, thus actuated, takes into the wheel, *h*, before referred to, on the bearing cylinder, *f;* and it is preferred that the point, *t*, should be applied so as readily to put into and out of gear, with its wheel, though not so shown in the engraving. By this arrangement of parts, a slow progressive motion is obtained for the whole machine; on the one hand, through the cylinder, *f*, and, on the other hand, a separate

* See August number, page 13.

rotary motion, at a certain increase of speed, is communicated through the wheel, *r*, to the pinion, *w*, fixed upon the shaft, *u u*, which last-named shaft has its bearings (*v v*) attached to the movable frame, *i i*. On the shaft, *u u*, are placed a series of plates or projections, fixed at regular distances. Or such plates or projections, with their ploughs, may be placed upon separate shafts, each with its own proper gearing; but it is preferred to place them on one shaft. These plates or projections have affixed to each of them several ploughs, which, in revolving, penetrate the soil, and by their mouldboards elevate and turn over portions thereof: *a a* are the plates or projections fixed upon the shaft, *u*. Each plate (*a'*) has three arms or prolongations (*b b b*), which terminate in the radial direction shown; a further prolongation (*d' d'*) is carried obliquely upon each of these arms. Upon the plate and projections thus constructed is affixed the tilling apparatus, which consists, first, of the part, *e*, which acts the part of the mouldboard or turn-furrow in the common plough; and it is to be fixed by screw bolts, or otherwise, to the prolongation, *d' d'*. To the fore part of this mouldboard (*e e*) is affixed a bar of wrought iron, which is also furnished with a lug, by which it is attached to the plate by means of screw bolts, or otherwise; the bar, thus secured, forms a head or share-bearer, as in many common ploughs. To the fore part of the bar the share is adapted, and fixed by its socket. The mouldboard, and also the share, may be varied in form. An adjustable fore-cutter or coulter is affixed in front of each share. It will be seen, that not only the ploughs which are set in the same plane around the axis follow each other into action, but that the ploughs of the other sets (which are affixed around the axis in parallel planes) are arranged and come into action so that two plough-shares will not strike the earth at the same instant.

ARCHITECTURAL NOTICES.



The Brock Monument.

The Committee for the Erection of the Brock Monument, on the Queenston Heights, invited Architects to compete in the preparation of Designs, by offering a premium of £25 currency to the successful competitor, whose design should be adopted. The meeting of the Committee took place, to receive the designs, on the 2nd of last month, at Queenston, and from thence adjourned to the 10th ult., at the Parliament Buildings, Toronto, where a large meeting of the Committee took place, viz.:—His

Honour the Chief Justice; Mr. Chief Justice Macauley, and Mr. Justice McLean; Sir Allan MacNab; Colonel Allen; The Hon. W. Robinson; T. C. Street, Esq., M. P. P.; The Honourable H. Merritt; Colonel McDougal; ——— Thauburn, Esq.; Captain Munro; &c., &c., and others, amongst whom were Dr. McCaul, President of the Toronto University; Captain Lefroy; W. Cayley, Esq.; &c., &c. After the inspection of the several designs submitted, the Committee awarded the premium to W. Thomas, Esq., Architect, of this City, for the best design; which is to be forthwith carried into execution, under his superintendance. A wood-engraving of which we insert.

In the preparation of this design, the endeavour has been to combine Architecture with Sculpture, so as to render it characteristic and appropriate, avoiding plagiarism, but without affecting that novelty of character, which would be injurious to the grandeur of the composition.

The Column, which is of the Roman Composite Order, with its Pedestal, stands on a platform, or sub-basement, of an elevation of 27 feet, at the angles of which are lions rampant, supporting shields with the armorial bearings of the Hero. It will be seen that the sub-basement is distinguished by plainness of character and great solidity, being 38′.0″ square at its base, having on one of its sides a plain polished granite slab, with a suitable inscription to the memory of the departed Hero, in letters of bronze. The sub-basement is placed on a platform slightly elevated, within a dwarf wall enclosure 77′.0″ square, with a fosse around the interior; at each angle are placed military trophies in carved stone 20′.0″ in height. It is proposed that the entrance to the enclosure, and doorway to the interior of the Monument, shall be on the south side, giving access to a gallery, or corridor, 120 feet in extent, round the inner pedestal, by 6 feet 6 inches wide; on the east and west sides of which, in suitable vaults under the floor, will be deposited the remains of General Brock, and those of his Aid-de-Camp, McDonnell. The gallery is lighted by circular wreathed openings. The bold rocky scenery of the Queenston Heights which surrounds the site of this proposed Monument, and the space immediately adjoining, together with the close masses of dense foliage in picturesque clumps, as seen in connection with it, induced the Architect, from repeated observations, so to elevate the column and pedestals, as not to have the general effect deteriorated by these objects, however beautiful they are, as taken separately. The pedestal to the column is 16′.9″ square and 38′.0″ in height, the die having on its enriched panneiled sides appropriate basso relievos. The plinth of the Order, as a blocking course to the pedestal, is enriched with lions' heads and wreaths, continued round each side, with wreathed openings between each, to give light to the interior. The column itself is 95 feet in height and 10 feet in diameter, fluted, and having an enriched base of laural leaves entwined on the lower torus; the base of the shaft is enriched with palm leaves, upon which the flutes terminate. The capital of the column, which is very beautiful, and particularly appropriate, is 12′.6″ in height; on each face will be sculptured a figure of Victory 10′.6″ in height, with extended arms over military shields, as volutes, having on their outward angles lions' heads, helmets, &c., the spaces between the acanthus being wreathed with palm leaves, somewhat after the example of a capital of an antique column at Albano, near Rome. The enriched abacus is 15′.0″ square, in the angles, of which will be formed spaces for persons to stand outside to view the surrounding scenery, to avoid the unsightly appearance of iron railings. Upon the abacus stands the cippus, supporting the Statue, which is to be of cast iron, galvanized, having within a chamber 6′.0″ diameter, for persons to stand in to view the magnificent scenery and interesting objects which the grandeur of the situation affords. Upon the cippus is raised a Statue of the Hero, proposed to be executed in stone, 16 feet high, in proper military costume. From the gallery in the sub-basement is continued to the summit a staircase of stone, of capacious breadth, of 250 steps, worked with a solid stone newel, the entire height lighted by small loop-holes in the fluting of the column. The whole height of the Monument, including the Statue, is 185 feet, to be executed wholly in Queenston stone; but it may be required to select a stone of finer quality for the basso relievos. The comparative heights of some of the principal monuments of the kind, ancient and modern, are as follow:—

	Entire height.
Pompey's Pillar	90.0
Trojan's Pillar	115.0
Antonio Column	123.0
Monument on Fish Street Hill	202.0
York Column	137.0
Napoleon Column, Paris	132.0
July Column, Paris	156.0
Alexander Column. St. Petersburgh	175.6
Melville Column, Edinburgh	152.7
Nelson Column, Dublin	134.0
Nelson Column, Yarmouth	140.0
Nelson Column, London, from the level of the pavement in Trafalgar Square	171.0

Thus, then, there is only one column, either ancient or modern, in Europe, that exceeds the entire height of the proposed Brock Monument, which is that erected in London by Sir Christopher Wren, in commemoration of the great fire in 1666.

His Royal Highness Prince Albert has honoured the distinguished Director of the Geological Survey, W. E. Logan, Esq., F.R.S., with an autograph letter, (accompanying a beautiful bronze Medal,) acknowledging the valuable services rendered by that gentleman to the Exhibition of Industry of all nations. We have much pleasure and pride in congratulating the President of the Canadian Institute upon this marked acknowledgment of his zeal and energy in so greatly adding to the interest and importance of the Canadian Department of the late Great Exhibition. Subjoined is a copy of the letter:—

Sir,—I have the honour, as President of the Royal Commission for the Exhibition of 1851, to transmit to you a medal that has been struck by order of the Commissioners, in commemoration of the valuable services which you have rendered to the Exhibition, in common with so many eminent men of all countries, in your capacity of juror. In requesting your acceptance of this slight token on our parts of the sense entertained by us of the benefit which has resulted to the interests of the Exhibition from your having undertaken that laborious office, and from the zeal and ability displayed by you in connexion with it, it affords me much pleasure to avail myself of this opportunity of conveying to you this expression of my cordial thanks for the assistance which you have given us in carrying this great undertaking to a successful issue. I have the honour to be, very respectfully yours,

ALBERT.

W. F. Logan, Esq., F.R.S.

Notes and Queries.

1. What is the most northern and what is the most eastern township in Western Canada, in which the Cactus is found?

2. What are the limits of the Black Walnut *(Juglans nigra)* and Sweet or Spanish Chesnut, *(Castanea vesca)?*

3. What is the botanic name of the tree which furnishes the White Wood of Western Canada, and in what district is it found?

SCIENTIFIC INTELLIGENCE.

Chemistry and Physics.

Coating Metals: Henry Grissell's (of the Regent's Canal Iron-works) improvement in coating metals with other Metals.—Patent dated January 11th, 1851. Enrolled July 10th, 1851, (London Patent Journal.)—The patentee's improvements in coating metals with other metals are as follows:—

Coating Iron with Zinc.—For this purpose the patentees use a bath or vessel of iron, or other suitable material, in which, by means of heat they melt the zinc, and on the surface of the melted zinc place a thick layer of chloride of zinc (prepared by dissolving zinc in muriatic acid, and driving off the water,) or a mixture composed of 8 parts of chloride of zinc, and 10 parts of chloride of potassium, or a mixture of equal parts of chloride of zinc and chloride of sodium, or chloride of potassium. When the metal and the salt are in a state of fusion, the iron to be coated with zinc is dipped into the metal, through the covering of fused salt, and becomes coated with zinc. If, however, it is found that a sufficient quantity of zinc has not adhered to the iron a small quantity of sal-ammoniac, in powder, is sprinkled over the iron, which is again dipped into the melted zinc. Under this part of their invention, the patentees claim the use of chloride of zinc applied as above mentioned in the fused state; also of the mixtures of the various salts above enumerated.

Coating Zinc, Iron coated with Zinc, or other Metal, with a Metallic Alloy.—For this purpose the patentees use a vessel of iron, or other suitable material, in which the alloy is melted. One of the alloys used by them is composed of zinc 10 parts, tin 26 parts, and lead 5 parts. A layer of chloride of zinc mixed with an equal weight of sal-ammoniac is kept in a state of fusion on the surface of the metal alloy, the temperature of which must not be carried higher than is sufficient to keep the alloy in a fluid state. The metal to be coated is dipped into the melted alloy, but not allowed to remain there longer than is absolutely necessary to receive a coating of the alloy. The patentees use also the alloy called "fusible metal," which they prefer to make as follows: bismuth 8 parts, lead 5 parts, and tin 3 parts; alloys of other compositions will do, provided that their melting points are below 400 deg. Fah. The patentees claim the use, in the manner above stated, of the alloys specified and referred to, and of the method above described for coating metals with such alloys.

Coating Iron or other Metal with Tin, or Tin alloyed with Lead.—For this purpose the patentees use a vessel of iron, or other suitable material, in which the tin alloy is melted, and on the surface of the fused metal lay a stratum of chloride of zinc, mixed with about its own weight of sal-ammoniac. The metal to be coated is then dipped into the metal liquid or alloy, until the coating is effected. The patentees state that it will be found advantageous, in the use of this and the preceding processes, to dip the metal to be coated several times, in order that it may come in contact often with the layer of fused salt; also advantageous in the preceding process to dip the iron or other metal into a hot and slightly acid solution of chloride of zinc, previous to immersion in the bath of melted metal. The patentees claim, under this head of their invention, the use of a mixture of chloride of zinc and sal-ammoniac forming a saline compound, which is kept in a state of fusion on the surface of the melted tin or alloy, in the process of coating metals with other metals.

Coating Iron or other Metal with Silver, or Alloy of Silver and Copper. In this case, the surface of the iron or other metal to be coated is to be amalgamated in the usual way. The patentees prefer to use for the amalgamating process, a mixture of 12 parts of mercury, 1 of zinc, 2 of sulphate of iron, 2 of muriatic acid, and 12 of water; the mixture to be heated, and, when 200 deg. Fah., the iron to be amalgamated is placed in the mixture, and the mercury rubbed on the surface of the iron. The silver, or alloy of silver, is then melted in a crucible, placed in a suitable furnace, and the amalgamated metal is dipped into it until it has a proper coating of silver or alloy employed.

Under this head, the patentees claim the process of coating iron or other metal or silver, or alloy of silver and copper, by amalgamating the surface of the metal to be coated, and then putting it into the melted silver or alloy.

Coating Iron with Copper, Brass, or any alloy of Copper, with Zinc, Tin, or Lead.—In this case, the copper or alloy used is melted in some suitable vessel, and on the surface of the melted metal is placed a layer of borosilicate of lead, (composed of 112 parts of oxide of lead, 24 of boracic acid, and 16 of silica,) and when the metal and the salt are in a state of fusion, the metal to be coated is introduced through the layer of salt into the melted metal, where it is allowed to remain long enough to acquire a coating of the metal. The patentees sometimes coat the iron with zinc, or with tin, or even amalgamate its surface with mercury, in the way above mentioned, and then proceed to dip it into the melted copper or alloy. Another method of coating iron with copper or brass, is that of exposing it to the vapor of chloride of copper, by placing that substance at the bottom of a copper crucible, in the upper part of which is placed the iron to be coated. The crucible is heated to redness, in a suitable furnace, and the vapors of chloride volatilize and coat the iron with copper. If the iron thus coated with copper be placed in the upper part of a covered crucible, in which metallic zinc, covered with animal and other charcoal, is placed, and heat applied as in the above case, the vapors of the zinc rise, and coming in contact with the copper-coated iron, convert the coating of copper into brass. Instead of chloride of copper, a mixture of metallic copper and sal-ammoniac may be used, or a mixture of oxide of copper and sal-ammoniac.

The patentees claim under this head of their invention, the use of borosilicate of lead, in a fluid state, over a surface of melted copper or brass, or of the alloys above mentioned, in the process of coating iron by immersion; also, the process of coating iron by the action of fused chloride of copper, or the mixtures above named, and of coating with brass by subsequent treatment with vapors of zinc, as above mentioned. —*Silliman's Journal.*

On Rain Waters.—M. Chatin makes the following statements as results of his operations:—

1. The chlorides which abound in the rains of maritime countries, are at Paris more abundant than in the waters of the Seine whenever the wind blows from the sea.

2. Sulphates exist in a notable quantity in the rain of Paris and in that of Central France; rain waters, though generally containing less of chlorides than the waters of rivers, usually surpass the latter in the proportion of sulphates.

3. Salts of lime and soda are contained in rain waters in an appreciable quantity.

4. Rain waters are especially distinguished by containing even half a decigramme to a litre of azotized organic matter, which may be represented in its composition by a mixture of ulmate of ammonia and ulmic acid; this ingredient is found also in the lower strata of the atmosphere, (though less at Turin and on the borders of the sea than at Paris and in Maurienne,) whence it is deposited by the dews and mists, and may be separated by washing.

5. Argillaceous earths retain better than lighter soils this principle dissolved in rain waters. The atmosphere, and the rains which wash it, perform an important part in agriculture, in restoring to the soil a portion of soluble mineral and organic matters highly useful to vegetation.

Dr. Kemp's Electro-Magnetic Engine.—A summary account of this invention was given in the *Mining Journal* for the 10th of January last; and, as the subject is one of considerable importance, a more extended notice will probably be read with interest. The prodigious

and, so far as our present experience goes, unlimited power of an electro-magnet in sustaining weights attached to an armature in contact with it has, in different countries, and at various times, induced inventors to adopt contrivances for pressing this agent into service as a labouring force; and experiments on a small scale have repeatedly led to the most sanguine expectations. A more rigid investigation has hitherto, however, proved the fallacy of these expectations, and the attempt to construct engines on a large scale been abandoned. Prof. Page's machine may, perhaps, be considered an exception to this remark, as it is well known that he has constructed and publicly exhibited a powerful working engine. Practical difficulties, however, seem to have intervened, or we should, doubtless, have seen it in extensive operation, the more especially as the magnificent grant of the American Government in aid of the professor's researches precludes the supposition that they are stopped for want of pecuniary resources.

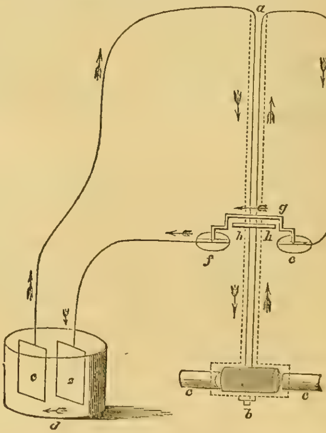
It would occupy too much space to enter into a detailed historical account of electro-magnetic engines. The means adopted, however, may be classed under two heads:—1. Those involving the direct action of an electro-magnet on its armature; and 2, those which employ a secondary action; thus the rotatory engines of Davenport, Jacobi, and the more recent elegant arrangement of Prof. Wheatstone, depend for their action upon a series of armatures, passing successively in front of stationary magnets, or *vice versa*; whilst that of Prof. Page depends upon the tendency of a bar of soft iron to place itself in a state of magnetic equilibrium, with reference to a succession of helical coils, through which, one after the other, the galvanic current is caused to pass. It may, however, be shown by experiment that this latter force, as well as that of an armature, passing in a circle concentric with a row of electro-magnets, is far inferior to that with which an electro-magnet attracts an armature, placed at right angles to its axes. This direct action was the first employed as a motive power; unsuccessfully, however, in consequence of the extremely small distance to which the magnetic energy extends. Could this difficulty be surmounted, no reason can be given why engines of any amount of power may not be constructed. In order to effect this object, Dr. Kemp introduces two contrivances, which may be used separately or conjointly, for the purpose of transferring the magnetic force. In the first place, a series of bars of iron, or armatures, are so arranged that they may successively come within the range of the lines of four of an equal number of electro-magnets, and so placed as that, in the course of their approach to the magnets, they cut the greatest possible number of magnetic curves. A further arrangement provides for the action of these armatures, by stems and stops, upon an armature plate, which is, in its turn, secured to the piston-rod of a cylinder filled with fluid. As the piston ascends, or descends, the fluid is forced into another longer cylinder, provided with a rod, which is brought by any suitable contrivance into connection with a crank, by which machinery may be caused to move. Instead of reciprocating motion, rotatory motion may at once be effected by means of a suitable disc. The whole invention then rests upon two facts, which cannot be disputed—1. That an electro-magnet is capable of attracting a considerable weight for a short distance; and 2, that this force may be transferred to machinery by means of incompressible fluids, or practically such.

Should it be found that this power can be economically applied, immense advantages must accrue from its use. The whole of the space occupied by fuel and boilers will be rendered available for passengers or freightage: and the value of this in one case alone—that of the Asia—will be represented by the enormous sum of £3200, at £4 per ton, for each voyage across the Atlantic. Its perfect safety, and freedom of risk from fire, must also recommend it especially for emigrant ships. In the locomotive department, the compactness and comparative lightness of the electro-magnetic engine must induce its substitution for the motive-power now in use. For canal navigation, this element of lightness must also be a great recommendation; and this species of property, so much depreciated by the competition of railways, may yet be rendered highly productive. For fire-engines, in connection with Gwynne's admirable centrifugal pump, it must be extremely serviceable, as it can be used in localities where, from want of working room, or the presence of irrespirable gases, the ordinary engine would be inadmissable. For all kinds of agricultural machinery, quartz crushing machines, mills, printing presses, and numberless other minor uses, its value must be apparent; whilst the lessening of insurance expenses would, in many cases, pay the cost of the engine, and defray the expenses of its working.

Coating and Ornamenting Zinc.—A patent has been taken out by Mr. F. H. Greenstreet, of Albany street, for coating and ornamenting zinc surfaces by means of acids alone, or in combination with other matters. The solution may be applied by sprinkling, dabbing, spreading, or marbling; and the surfaces are capable of further ornamentation by painting. Muriatic acid, diluted with water to about 1·114 specific gravity, gives a light ash colour; chrome yellow, with the same acid, a yellowish grey; Saxony green, mixed gradually with the acid to a paste, and stirred until effervesence ceases, produces greenish iron grey; white lead with the acid, or Kremintz white, gives a grey coating; the acid with sulphur produces a yellowish white. Butter of antimony gives a black colour, but when mixed with the other pigments does not effect them; but makes a good ground work. The surfaces having been coated, should be protected by a coat of varnish. Copal may be used, but the patentee prefers a preparation of wax, as effectually preventing oxidation.

The Electric Clock.

The following engraving illustrates the application of electricity in moving the pendulum of Mr. Bain's electric clock. The pendulum *a* is drawn in dotted outlines. The bob of the pendulum *b* is a brass box containing a coil of covered copper wire on a bobbin; and *c c* represent permanent bar-magnets projecting from opposite sides of the clock-case in the centre of the pendulum bob; while *d* is a voltaic pair with the current shown by arrows. Dr. Wilson in his work on electricity, gives the following account of the operation:—



"A wire from the copper is conducted to the top of the pendulum-rod, then down its left-hand side to the bob, in which it is coiled many times, and then ascending on the right side to the top of the pendulum-rod, it is brought down within the clock-case, and terminates in a disc *e* made of grooved agate. The black dot in the groove represents a gold stud which forms the termination of the wire from the copper. *f* is a second grooved disc, made, however, entirely of metal, from which a wire proceeds to the zinc. The current thus can only pass, if a metallic bridge stretches from the disc *f* to the gold stud in the disc *e*. This bridge *g g* stands on the grooves in the two discs, the left extrem-

ity sliding in the metal, the right extremity in the agate. *h h* is a piece of brass attached to the pendulum-rod, so as to touch the bridge and carry it from side to side. In the diagram the apparatus is not acting. Suppose, however, that the right hand extremity of the bridge touch the gold stud in the agate disc, then the current passes, the coil of wire in the pendulum-bob becomes magnetic, and is carried to the *left* by the action of the bar-magnets. In so doing it slides the bridges off the gold stud, and thereby cuts off the current from itself, and loses magnetism. It returns to the *right* by its own weight, but in so doing it replaces the right end of the bridge on the gold stud, and thus restores the current to the wire and renews its magnetism ; and so on *ad infinitum*. Strictly speaking, the edges only of the disc should be shown ; they are represented as if seen a little obliquely from above, for the sake of indicating the grooves more distinctly."

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—August, 1852.

Latitude 43 *deg.* 39.4 *min. North. Longitude,* 79 *deg.* 21 *min. West. Elevation above Lake Ontario :* 108 *feet.*

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.
						°	°														
b	1	29.610	29.661	″	″	50 3	64.5	′	″	0.304	0 423			85	72			Calm.	W b S	Calm	0.045
a	2	.747	.731	29.721	29. 737	46.7	66.2	54 5	57 38	.294	.443	0.375	0.363	93	71	90	79	Calm.	N	Calm	0.075
a	3	.673	.602	.497	. 577	52.1	66.3	61.4	61.05	326	.395	.444	.392	85	63	83	76	N N E	S	Calm	- -
a	4	.423	.367	.310	. 375	53.9	71.1	63 2	63.88	.366	.477	.438	.420	90	64	77	74	Calm.	E	NE b N	0.165
c	5	.378	.428	.507	. 438	60 8	65 6	61 4	62 77	.453	.479	.470	.466	87	78	89	84	E N E	E NE	Calm	0.255
c	6	.528	.600	.619	. 583	61.0	65.7	57.8	62 32	.457	.544	.445	.485	87	88	95	88	N b E	Calm	Calm	1.055
c	7	.608	.554	.552	. 571	59 9	73 5	62.6	66.43	.447	.594	.467	.509	88	73	84	80	N b W	SS W	Calm	Inap
c	8	.553	.541			60 6	74.2			.467	.535			90	66			Calm.	S	SS W	- -
b	9	.623	.619	.684	. 646	63.6	71.1	63 5	65.50	.501	.599	.500	.531	88	81	88	87	N	SE b E	Calm	0.765
c	10	.731	.735	.749	. 739	60.0	71 6	59.9	63.73	.336	.430	.366	.394	76	56	73	68	N	SE b E	N	- -
c	11	.769	.777	.779	. 776	57.9	72 7	56.4	63.10	.342	.500	.334	.385	73	64	75	68	N	SE b S	N E	- -
b	12	.825	.778	.776	. 788	55 3	73.7	61.7	65.03	.378	.500	.417	.426	88	62	78	71	N b W	S	Calm	- -
c	13	.810	.753	.683	. 740	55 3	75.4	63.7	66 07	.387	.522	.445	.456	90	61	78	74	Calm.	S	Calm	- -
b	14	.631	.533	.531	. 560	61 3	76 5	69 9	68.98	.472	.574	.481	.521	89	65	68	76	Calm.	S b W	SS W	0.055
a	15	.591	.639			62 5	72.1			.511	.446			93	58			Calm.	NW b N	Calm	- -
a	16	.937	.911	.849	. 895	48.8	65 6	52.1	57.42	.292	.352	.350	.334	86	58	91	73	N b E	E N E	E NE	- -
a	17	.832	.800	.755	. 790	50 6	70 7	56.1	61 50	.317	.512	.379	.422	89	71	85	79	N	SE b S	Calm	- -
ab	18	.747	.608	.621	. 659	53 8	76 2	63 6	65 80	.383	.568	.455	.485	94	64	80	78	Calm	S	Calm	- -
a	19	.625	.590	.662	. 629	60.3	81 2	70.4	71.00	.454	.691	.588	.581	88	67	82	79	Calm	S b W	Calm	- -
a	20	.744	.752	.746	. 741	64 4	72 9	65.7	68.05	.543	.578	.515	.542	92	73	84	82	Calm	E b S	N E	- -
a	21	.753	.753	.760	. 752	64 6	72.6	67.6	68.70	.443	.635	.478	.545	75	81	73	79	NE	E	Calm	- -
ab	22	.799	.777			68.1	70.4			.598	.578			90	80			E	E N E	E	- -
c	23	.775	.744	.742	. 755	68.9	79 1	70.6	72 92	.623	.745	.601	.645	91	78	83	83	E b S	SE b E	Calm	- -
c	24	.718	.662	.655	. 672	66 5	77 0	70 2	72.12	.582	.722	.652	.673	93	81	91	88	Calm	S b E	Calm	0.110
e	25	.633	.571	.503	. 557	66.1	77 3	67.1	71.10	.586	.744	.574	.643	95	82	89	87	Calm	SE b S	Calm	0.170
c	26	.468	.405	.427	. 427	65 7	78 4	70 5	71.15	.591	.718	.552	.620	97	76	77	84	Calm	S	NE b N	Inap
c	27	.490	.550	.612	. 559	61 4	68.3	57 6	63 35	.442	.444	.361	.415	84	66	78	73	Calm	NW	N	- -
c	28	.661	.677	.700	. 684	54 3	69.1	59.2	60.97	.325	.429	.383	.375	78	62	73	71	N b E	SE	N b W	- -
ab	29	.764	.803			54.9	71.6			.298	.526			70	71			N	S b E	SW b S	- -
a	30	.917	.904	.874	. 895	51.0	73 5	56.8	62.65	.290	.490	.348	.397	79	61	77	71	Calm.	S	Calm	- -
—	31	.894	.793	.738	. 798	53 3	76.4	63.8	66.20	.359	.524	.453	.460	90	60	78	75	N b E	S	Calm	- -
	M	29 6901	29.6619	29.6562	29 6671	58.35	72.60	62.59	65 35	0 425	0.545	0.457	0.481	87	69	82	78	Ml's 1.93	Ml's 6.17	Ml's 1.27	2.695

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1022.92	340.60	877.05	733.92

Mean velocity of the wind - - 3.30 miles per hour.
Maximum velocity - - - - - - 18.8 miles per hour, from 10 to 11 a.m. on 27th
Most windy day - - - - - - 27th : Mean velocity, 8 39 miles per hour.
Least windy day - - - - - - 1st : Mean velocity, 1.19 ditto.
Most windy hour - - - - - - 1, p.m. Mean velocity, 6.25 ditto.
Least windy hour - - - - - -10, p.m. Mean velocity, 1.27 ditto.
Mean diurnal variation - - - 4 98 miles.

A considerable number of shooting stars observed on the nights of the 10th, 11th, and 12th August.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows :—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the Horizontal Force also.

Thunder Storms.—4th, distant thunder, at 2 P.M.
5th, distant thunder, at 2 P.M.
14th, thunder, lightning, and rain, from 11 A.M. to midnight.
19th, sheet and forked lightning, 9 to 10 P.M.
24th, thunder, lightning, and rain, from 2—20 to 3 P.M.
26th, thunder storm—ceased 7-10 A.M. Thunder, lightning, and rain, at 3 P.M.

Highest Barometer - - 29.955, at 8 A.M., on 16th } Monthly range :
Lowest Barometer - - 29 310, at 10 P.M., on 4th } 0.645 inches.
Highest observed Temp. - 81.2, at 2 P.M., on 19th } Monthly range :
Lowest regist'd Temp. - 45.8, at A.M., on 2nd } 35.4
Mean Highest observed Temperature - - 72 59 } Mean daily range :
Mean Registered Minimum - - - - - - 56.83 } 15.77
Greatest daily range - - - 24.9 from 2 P.M., of 15th, to 6 A.M., of 16th.
Warmest day - - 23rd - - Mean Temperature - 72 92 } Difference :
Coldest day - - - 2nd - - Mean Temperature - 57.38 } 15.84

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for August.

Year.	Temperature. Mean.	Max.	Min.	Range.	Rain. Days.	Inches.	Wind. Mean Velocity.
	°	°	°	°			Miles.
1840	64 65	80 1	47 4	32 7	12	2.950	--
1841	64.15	83.5	46 7	36 8	9	6.170	--
1842	65.46	80.7	45 3	35.4	6	2.500	--
1843	66 01	85 5	44.4	41 1	4	4.850	--
1844	63 72	82.5	44 3	38.2	17	imperfect	--
1845	67.35	82 5	44 4	38 1	9	1.725	--
1846	67 91	86 3	50.4	35 9	9	1.770	--
1847	64.29	83.1	44 9	38 2	10	2.140	--
1848	68 64	87.5	49.3	38.2	8	0.855	4.55
1849	65.43	79 5	51.4	28.1	10	4.970	3.76
1850	66.64	84.2	43 0	41 2	13	4.355	4.46
1851	63.59	79 8	43 6	36.2	10	1.360	4.62
1852	65.35	81.2	46.7	3[illegible] 5	9	2.675	3.30
Mean	65.62	82.80	4[illegible].29	36.51	9.7	3.025	4.14

MISCELLANEOUS INTELLIGENCE.

DOMESTIC.

Bytown and Prescott Railway.

This undertaking, which was commenced in the spring of 1851, and has, since then, quietly, unobtrusively, but surely, been advancing towards completion, is destined, ere long, notwithstanding the small share of public notice it has hitherto attracted, to rank as one of the most important lateral railways in the province. Whether viewed as a 'feeder' to the "Main Trunk," or as an *independent track*, connecting the commerce of the Ottawa with that of the St. Lawrence, and opening to the vast region watered by the former of these monarch streams, (which the old "voyageurs" loved to call "La Grande Rivière du Nord") a new channel of trade, viâ the Ogdensburgh Railway, to the several seaboard cities of the United States, its importance as a great public work can scarcely be over-rated. At some future period, we may lay before our readers a statistical sketch of the "Ottawa country," the capital of which—Bytown—bids fair to rival, in size and commercial importance, the most thriving of our Canadian cities. To us of this more favoured "West," comparatively little is known of that most interesting section of the country; but we have "facts" and "figures" before us to show that, whilst it is little behind us in the ordinary march of improvement and civilization, it has outstripped us in enterprize: its merchants and capitalists having boldly undertaken, not only unaided from any outward resource, but in the face of much selfish opposition, to commence the railway we are speaking of; and which, from all present appearances, is likely to be the first *completed* work of the kind in Upper Canada.

The distance, by this route, from the Ottawa to the St. Lawrence is 53¾ miles. For some 20 miles from Bytown, the road is laid parallel to, and within a short distance of, the St. Lawrence, passes through the flourishing village of Kemptville, and has its southern terminus near the eastern limits of the town of Prescott, opposite to the Ogdensburgh Railway Depôt,—at a point where the St. Lawrence *never freezes up*. The country through which the line runs is of high agricultural capabilities—is rapidly improving—and as a *fall wheat growing country*, we have seldom seen it surpassed, even in the western portions of the province. The features of the ground are highly favourable for the construction of a railway. There are to be no grades exceeding 30 feet in the mile, whilst more than half the road is *level*. Its lineal arrangement shows about four-fifths straight line, in tangents of from 4 to 7 miles. Upon the whole, its capacities, as a freight road, cannot be surpassed in the province, and are such as will admit of the timber of the Ottawa being deposited on the banks of the St. Lawrence in such quantities, and at such rates, as will make Prescott the great lumber mart, not only for a wide tract of our own country, but also for a large portion of the state of New York. The work of grading was boldly commenced last October, and is now well advanced. Much has been done with very little means,—the expenditure thus far having been wholly provided for by the two towns it is destined to connect: affording to many richer communities an example of courageous enterprize, which they would do well to profit by. We observe that the Municipal Councils of the several counties interested in the undertaking have petitioned parliament for aid to bring their work to a successful completion. They have watched whilst others slept; and we heartily wish them the success they merit. We look upon this undertaking as one of such real importance that we shall probably revert to it again, and enter more fully into the details of the project.

Railway Suspension Bridge over the Niagara River.—The Bridge will form a single span of 800 feet in length. It is to serve as a connecting link between the railroads of Canada and the State of New York, and to accommodate the common travel of the two countries. It is established by ample experience, that good iron wire, if properly united into cables or ropes, is the best material for the support of loads and concussions, in virtue of its great absolute cohesion, which amounts to from 90,000 to 130,000 lbs. per square inch according to quality. The Bridge will form a straight hollow beam of 20 feet wide and 18 deep, composed of top, bottom and sides. The upper floor, which supports the railroad, is 24 feet wide between the railings, and suspended to two wire cables assisted by stays. The lower floor is 19 feet wide and 15 high in the clear, connected with the upper one by vertical trusses, forming its sides, and suspended on two other cables, which have 10 feet more deflection than the upper ones. The anchorage will be formed by sinking 8 shafts into the rock 25 feet deep. The bottom of each shaft will be enlarged for the reception of cast iron anchor plates, of 6 feet square. These chambers will have a prismatical section, which, when filled with solid masonry, cannot be drawn up without lifting the whole rock to a considerable extent. Saddles of cast iron will support the cables on the top of the towers. They will consist of two parts—the lower one stationary, and the upper one moveable, resting upon wrought iron rollers. The saddles will have to support a pressure of 600 tons, whenever the Bridge is loaded with a train of maximum weight. The towers are to be 60 feet high, 15 feet square at the base and 8 at the top. The compact, hard limestone, used in the masonry of the towers will bear a pressure of 500 tons upon every foot square:—

Weight of Bridge.

Weight of Timber,	910,130 lbs.
Wrought Iron and Suspenders,	113,120 lbs.
Castings,	44,332 lbs.
Rails,	66,740 lbs.
Cables between Towers,	534,400 lbs.
	1,678,722 lbs.

Weight of Rail-road Trains.

One Locomotive,	25 tons.
27 double freight Cars, each 25 feet long, and of 15 tons gross weight,	405 tons.
Making a total gross weight of 430 tons which will fall upon the cables when the whole bridge is covered by a train of cars from end to end: and to this 15 per cent weight of pressure as the result of a speed of 5 miles per hour, which is a very large allowance,	61 tons.
Add weight of superstructure,	782 tons.
Total aggregate maximum weight,	1,273 tons.

The tension of cables, which result from a weight of 1,373 tons and an average deflection of 59 feet, is 2,340 tons. Since the assumed maximum tension can but rarely occur, it is considered ample to allow four times the strength to meet this tension—that is 8,960 tons. But assuming 2,000 tons as a tension to which the cables may be subjected, five times the strength to meet it is allowed, and an ultimate strength of 10,000 tons provided for. For this purpose, 15,000 wires of No. 10 will be required. At each end of the upper floor the upper cables will be assisted by 18 wire rope stays, and their strength will be equivalent to 1,440 wires; these deducted leave the number of wires in the four superior cables 13,560, the number of wires in the four superior cables 13,560, the number of wires in one cable 3,390, diameter of cable 9¼ inches. The rail-road bridge will be elevated 18 feet on the Canadian, and 28 on the American side, above the present surface of the bank, and above the present structure. It will be the longest railroad bridge, between the points of support, in the world.—*St. Catharines Journal.*

Canals of Canada.—The gross revenue derived from all the Canals of Canada, for 1851, was £79,999; the expenses were £27,335. The number of vessels which passed through the Canals for the same year was 18,874: the total tonnage, 1,973,841.

Canal Tolls.—The tolls collected on the Welland Canal during the month of July last, was £7682 3s. 8d., against £5909 7s. 6d. in the same month of last year. The number of vessels passed through was 750, being an increase of 60 over July of last year, and of 262 over the same month in 1850.

New Church.—The result of the competition by W. Thomas, Messrs. Cumberland & Storm, and J. Sheard, in preparing designs for the erection of an Irish Presbyterian Church, at the corner of Queen and Mutual Streets, in this City, has been the adoption by the committee of the design of W. Thomas, Esq., Architect. The Church is of the Norman or Lombardian style of architecture, with two staircase towers and spires on the principal front, to Queen Street, to be erected of white brick, with open timbered roof to the interior, and with circular apsis at the north end. The size of the body of the Church is 81'.0" by 55'.0", and will give an accommodation of 612 sittings on the ground floor.

We are gratified to learn that Sir Chas. Lyell, who stands at the head of modern geologists, arrived at Halifax by the last Steamer, and immediately proceeded to visit the County of Albert, in this Province, now becoming celebrated for its mineral wealth. As this Province requires only to be better known, to take a much higher rank than has hitherto been given to it, we look upon the visits, and the publicity given to the opinions of such gentlemen, as of very great importance. The opinion of Sir Charles will go far to settle the much disputed coal or asphaltum question, as if this mineral is in the place where it has been formed, it will belong to the coal family; and on the other hand, if it has been melted and ejected into its present situation, it will be entitled to the name of asphaltum.—*Nova Scotia paper.*

FOREIGN.

The New Crystal Palace at Sydenham.

On Thursday last the first column of the new Crystal Palace was erected, amidst the acclamations of a large and very respectable company. The scenery around the spot chosen is very beautiful, and the site presents facilities and opportunities which, it is expected, will be made good use of by those who have charge of the undertaking.

The company present included many illustrious in rank, science, literature, and commercial rank; and letters of apology, regretting their absence, were read from some of the most distinguished persons in the country.

At half-past two o'clock, the visitors, guided by a programme which had been delivered to them, assembled round the spot where the pillar of the palace was to be planted; and shortly afterwards a procession advanced, preceded and marshalled by Mr. Harker, the toastmaster. Six workmen, bearing a large and handsome banner, inscribed "Success to the Palace of the People," were followed by Mr. Laing, M.P. (the Chairman of the Crystal Palace Company), Mr. F. Fuller, and the other directors. The column was immediately raised and inserted in its socket, three young lads assisting in the operation. A bottle was deposited under the pillar, containing the coins of the realm, and a paper bearing the following inscription:—

"This Column, the first support of the Crystal Palace, a building of purely English Architecture, designed for the recreation and instruction of The Million, was erected on the 5th day of August, 1852, in the 16th year of the reign of Her Majesty Queen Victoria, by Samuel Laing, Esq., M P., Chairman of the Crystal Palace Company. The original structure, of which this column forms a part, was built, after the design of Sir Joseph Paxton, by Messrs. Fox, Henderson, & Co, and stood in Hyde Park, where it received the contributions of all Nations, at the World's Exhibition, in the Year of our Lord 1851.

"I, your glass,
Will modestly discover to yourself
That of yourself which yet you know not of."

The new building, which is expected to be finished by the 1st of May, 1853, will differ in many important respects from the old. In consequence of the great fall in the park in which it will be situated, an additional story will be necessary in front, which will have the effect of remedying a defect in the old structure,—the want of elevation, as compared with its vast length. A slight curtailment of length will also be made, although the area of ground covered will be equal to that occupied by the Hyde-park building. The centre transept will be extended into a semi-circular roof of 120 feet diameter; and two smaller transepts will be placed towards the ends of the building. The centre transept will be nearly 200 feet in height, and 120 in width; those at the sides 150 feet high, and 72 wide. The columns and girders, instead of falling so rapidly towards the extreme end, and thereby preventing the spectator from arriving at a conception of the extent of the building, will not now keep the same line as before, but every 72 feet pairs of columns, 24 feet apart, will advance 8 feet into the nave, and from these columns will spring arched girders 8 feet deep, in lattice work of wrought iron, which support the girders of the roof. These advancing columns, tied together, will form groups of pillars like those in a gothic cathedral, and occurring at every 72 feet down the nave, will furnish to the eye a means of measuring which it had not before. The ends of the building will extend into large wings, attached to one of which will be the railway station, and these wings will terminate in lofty glass towers. The area in front will be laid out in terraces and gardens, interspersed with statues, fountains (one of which will rise to the height of upwards of 200 feet), and temples, and adorned by a choice collection of plants, shrubs, and flowers.

One of the most conspicuous and attractive sections will be that of Ethnology. No museum has yet ever attempted to show models of the different varieties of the human race, together with their national costumes, their domestic and agricultural implements, their armour, their dwellings, their modes of conveyance, and other characteristic objects appertaining to them. But, under the guiding direction and personal superintendence of such an eminent ethnologist as Dr. Latham, no fears are entertained but that all these will one day ornament the compartments of this noble building, and that a very large proportion of a complete collection will be ready by the opening.

It is intended to arrange the growing plants in such a manner as to show what are the peculiarities which mark the Flora of different parts of the world. To this end the surface of our globe will be divided into regions, or natural provinces, which are each characterized by particular races of animals and vegetables, and all the arrangements of natural objects will tend towards the due illustration of the "countries" (as it were) which nature has mapped out upon our earth, and which she has peopled with the subjects of her three kingdoms.

The ethnological specimens will, therefore, appear near the plants of the region to which they both belong. Close by them will be placed specimens of the most characteristic quadrupeds, birds, reptiles, fishes, mollusca, and insects, which are to be found in the same parts of the world. All these will be shown in the attitudes most natural to them, and best exemplifying their peculiar habits and dispositions; for which purpose the assistance of the exhibitor of the most life-like stuffed specimens in the Great Exhibition will be obtained. The fish will be preserved on a plan not hitherto tried, that of making them appear to be swimming, in very large glass vessels containing a sufficient quantity of some preservative fluid having the appearance of water. The mollusca will be represented, not by their shell only, but by shells containing models of the animals crawling or swimming in the localities peculiar to them; and in all cases the soil or situation which all these creatures inhabit will be imitated and represented as closely as possible. So that a visitor will find himself surrounded, wherever he goes, by groups of objects, taken from all the three kingdoms of nature; not placed, like museum specimens, "all in a row," but artistically arranged so as to exhibit individual habits and peculiarities to the best advantage; and so associated as to give an accurate idea of the Fauna and Flora of the region they are designed to illustrate. The selection of characteristic examples of the zoological portion has been kindly undertaken by Professor Edward Forbes, Mr. Waterhouse, and Mr. Gould, whose attainments, as naturalists, are too well known to need comment; and the whole will form an extensive series of small collections, illustrating, in a manner never hitherto attempted, the physical geography of the whole world. Such an exhibition, while it cannot fail to be amusing, will be, at the same time, replete with instruction of the soundest character, and afford a clearer insight into the subject of the distribution of plants and animals on the surface of the earth than many months of reading.

It is ultimately intended to exhibit a series of geological illustrations, corresponding to those of physical geography, on a scale which no geological museum can attempt, for want of space. Not only will the external appearances of the earth's crust at different places be shown, but also the geological strata of particular portions. Models will be prepared to illustrate mining and quarrying, to show the action and results of volcanoes and earthquakes, and to exhibit geology in its practical bearings with reference to well-sinking, the supply of water tunnelling, &c. The name of Professor Ansted will be a sufficient guarantee for the accuracy of execution of these details.

For the present, however, the principal endeavours of the Company are concentrated in bringing out as complete a collection as possible of life-sized restorations of those colossal extinct animals and birds, which we now only know of by their fossil remains. Under the direction of Dr. Mantell, it is confidently believed that a museum of such creatures will be formed which will excite the wonder of every one, and afford little opportunity for disapprobation, even amongst the most scrupulously particular anatomists.

Reference must also be made to another section of the natural history department, which is likely to prove the most useful and commercially valuable portion of the exhibition; though, perhaps, not one of the most attractive. We allude to the collection of raw produce, which is designed to show all the various articles taken from the animal, vegetable and mineral kingdoms, and applied to ornamental and useful purposes by the skill of man. With this view, the directors invite the assistance of all, in the way of contributions of raw products, either now in use or likely to be brought into use, in the arts and manufactures; and they may reasonably look forward at no distant period to being able to show such a collection of raw materials, conveniently arranged and tritely labelled, as shall not only convey an immense amount of useful instruction to the mass, but give a far greater impulse to improvement amongst the manufacturers of Europe than was imparted even by the Great Exhibition of 1851.—*Illustrated London News.*

The Electric Time-Ball in the Strand.—After the satisfactory completion of the requisite arrangements which had been for some time pending between the Electric Telegraph Company and the Astronomer Royal at Greenwich, Mr. Edwin Clark, the Company's engineer, had entrusted to him the construction of the ingenious apparatus for the developement of the electric telegraph system, as applied to the regulation of time on a plan for distributing and correcting mean Greenwich time in London and at all the principal ports throughout the United Kingdom every day at one o'clock. The ball that has recently been raised on a pole upon the dome of the Electric Telegraph Company's West-end station, No. 448, Strand, opposite Hungerford-market (similar to the ball which surmounts the Royal Observatory at Greenwich,) which is a remarkable object of attraction to all persons passing to and from the west-end to the city, is now completed. It is about 6 feet high and 16 feet in circumference, made of zinc, and painted of a bright red colour, so that it may the more clearly be discerned at a distance, and can with ease accommodate three persons in the interior. It has a broad gilt belt round it, thus having the appearance of a "great globe," and at the extremity of the shaft is a cross, or bright gilded weather wand, with the four points, N. S. E. W.; and below the arms of the Electric Telegraph Company, with their initials, "E. T. C." Many difficulties have been experienced in the completion of this new

idea of electricity, in consequence of numerous obstacles with regard to the correct working of the telegraph wires along the streets of London and the Greenwich Railway to the Royal Observatory. These, however, have been overcome to the great satisfaction of the directors of the Company and the Astronomer Royal, and for the last three days the experiments have been made with the most complete success, the ball or globe dropping by the electric action simultaneously with the one at the top of the Royal Observatory, precisely at one o'clock, P. M., both balls being in fact, liberated by the same hand. It is now in active operation, and will communicate the standard time of Greenwich and London, by the different lines of railway, to all the principal ports of the United Kingdom and Scotland on the same principle, as arrangements have been made to make it one of the most complete improvements of the present day, not only as regards the time for regulating chronometers on board vessels, but the chief public clocks of the metropolis, and from one end of the country to the other. An electric dial is now being completed in the midway opposite the office in the Strand which separates the crossings, and the new lamp, or light, at the top of the post has been tested as to its power of reflection, and that dial or electric apparatus will show forth the hour, minutes, &c., both day and night, to the public.—[*Ibid.*

Submarine Rock Blasting.—The reef rocks at Hurl Gate, New York, are in course of being blasted, and the New York *Tribune* of the 22nd ult. in describing a resumption of the process, says,—"The firing recommenced on Way's Reef. Since then thirty-eight charges have been fired on that rock, and we hope it will be reduced to fifteen feet mean low water before the close of next week. The firing on Way's Reef is from a battery of ten pairs of plates, placed on the metal float moored on that reef. As many as nine charges have been fired during a single tide. As soon as Way's Reef is broken down, 'Shell Drake Rock' will be fired upon, until it is reduced to fifteen feet below mean low water. After that, 'Frying Pan,' a very dangerous rock in mid-channel, and in rapid and deep water, will be attacked, and the firing continued on that rock until it is reduced to the same depth as Pot Rock, namely, 20½ feet below mean low water. As soon as the rocks here mentioned shall have been reduced to the depths respectively stated above, operations by Messrs. Maillefert and DeRaasloff, will be commenced on Diamond Reef, situate between Governor's Island and the Battery. This is a large rock in 16 feet water. A charge containing 500 lbs. of powder will be fired on this rock. Two blasts will be made on Hallets Point, at the Gate, in which a preparation of potash will be used for blasting. The whirlpool has been entirely filled up by the *debris* of Pot Rock, and the smallest row boat may pass over what was once Pot Rock, at any time of tide. This great and wonderful result M. Maillefert has accomplished by the firing on the surface of the rock under water without any drilling, 284 submarine charges, containing in all 34,231 lbs. of powder, and at a cost of less than 7,000 dollars. It is a work of great importance to the United States, and in fact to the whole world, and is conducted with the greatest economy. We purchase the powder, blasting-cans, and ballast-bags with ready money, and pay M. Maillefert weekly a stipulated price for each charge fired on the rock; he furnishing the labourers employed, the wires, battery and floats. The expense of removing Pot Rock, Frying Pan, and Diamond Reef, to the depth of 20½ feet, and Way's Reef and Shell Drake Rock to the depth of 15 feet below mean low water, will probably not exceed 15,000 dollars. The success that has attended M. Maillefert's new mode of submarine blasting will greatly benefit the commerce of the world, will be the means of saving thousands of lives and millions of dollars in value of property; for this system of submarine blasting will be adopted in every place where dangerous rocks obstruct navigation, inasmuch as but a small sum of money is required to pay the expense, compared with what would be required under the old system. His excellency the Portuguese minister takes great interest in these operations, and he has communicated to his government the result thus far obtained at Hurl Gate. In April last the Portuguese war steamer Porto made dreadful shipwreck on a rock in the harbour of Oporto. The most influential families in that city have now obtained one of the Francis metallic life-boats, and are in hopes to obtain the services of Messrs. Maillefert and De Raasloff to remove this dangerous rock by submarine blasting. M. Maillefert has entirely recovered from the wounds he received by the disastrous explosion of a blasting-can above water, during the operations on Frying Pan, on 26th March last."

French Researches at Nineveh.—The Minister of the Interior has received further accounts of the explorations, which are being carried on by M. Place, Consul of France at Mossul, in the ruins of Nineveh. In addition to large statues, bas-reliefs in marble, pottery, and articles of jewellery, which throw light on the habits and customs of the inhabitants of the ancient city, he has been able to examine the whole of the palace of Khorsabad and its dependencies, and in so doing has elucidated some doubtful points, and obtained proof that the Assyrians were not ignorant of any of the resources of architecture. He has also discovered a large gate twelve feet high, which appears to have been one of the entrances to the city, several constructions in marble, two rows of columns, apparently extending a considerable distance, the cellar of the palace still containing regular rows of jars, which had evidently been filled with wine—and at the bottom of which jars there is still a sort of deposit of a violet colour. M. Place has, moreover, discovered the storehouse of pottery, containing various articles. In addition to all this, he has caused excavations to be made in the hills of Bachiccha, Karamless, Teu Leuben, Mattai, Karakock, Digan, &c., on the left bank of the Tigris, within ten leagues from Khorsabad. In them he has found monuments, tombs, jewellery, and some metals and stones. At Dgigiran there is a monument, which, it is supposed, may turn out to be as large as that of Khorsabad. At Mattai, and at a place called Barrican, M. Place has found bas-reliefs cut in solid rock; they consist of a number of colossal figures and of a series of full-length portraits of the Kings of Assyria. M. Place has taken copies of his discoveries by means of the photographic process; and has been authorized to make diggings near the palaces which the English are engaged in examining.

Prizes of the Academy of Sciences of Paris.—At the session of the 22nd of March, the prize in Astronomy, for 1852, was divided between Mr. Hind and M. de Gasparis, the former for his discovery of the new planet Irene, and the latter for that of Eunomia. The Cuvierian prize (a triennial prize and never before awarded) was given to Professor Agassiz for his Researches on Fossil Fishes.

Among the prizes offered, is one for 1854, in the department of Mathematics, as follows:—To determine the equations of the general movements of the earth's atmosphere, having in view the rotation of the earth, the calorific action of the sun, and the attraction of the sun and moon. The authors are desired to exhibit the concordance of their theory with the best observations on the atmospheric movements. Even if the whole question is not resolved, but some important steps are made towards its solution, the prize will be awarded by the academy. The prize is a gold medal of 3,000 francs.

There is also an extraordinary prize for 1853, on the application of steam to navigation. The prize was proposed first in 1836, and has been continued to 1838, 1841, 1844, 1848, and finally to 1853. It is offered "for the best work or memoir on the most advantageous em-employment of steam for steamships, and upon the best system of mechanism, 'installation,' stowage, and armament for such vessels." The prize is 6,000 francs. Time, December 1, 1853.

A British Industrial University.—In course of last month it was announced in our columns that there was reason to believe His Royal Highness the Prince Consort "contemplated the foundation of a great building and establishment in which theory would be combined with practice, in the advancement of science and art, by a concentration of talent and skill." We believe we may now state without any impropriety that in all probability the surplus of £150,000 and upwards, in the hands of the Royal Commission of the Great Industrial Exhibition of 1851, will be devoted to the foundation of an Industrial University in London, such as was long since mooted in The Builder. This central concentration of science and industry will ultimately be organized, with radii or branch institutions, throughout the whole country; but we scarcely think that the Royal Commissioners, as has been stated, have as yet formed any definite scheme for the establishment of such a university, although it is their known design to carry out the idea.—*Builder.*

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the Improvement in Art, and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, OCTOBER, 1852.

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PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

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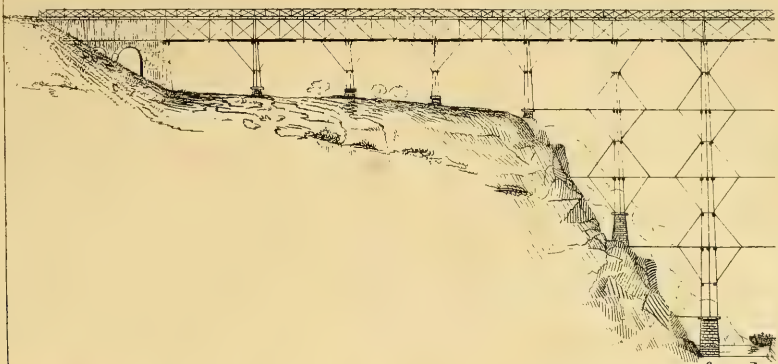

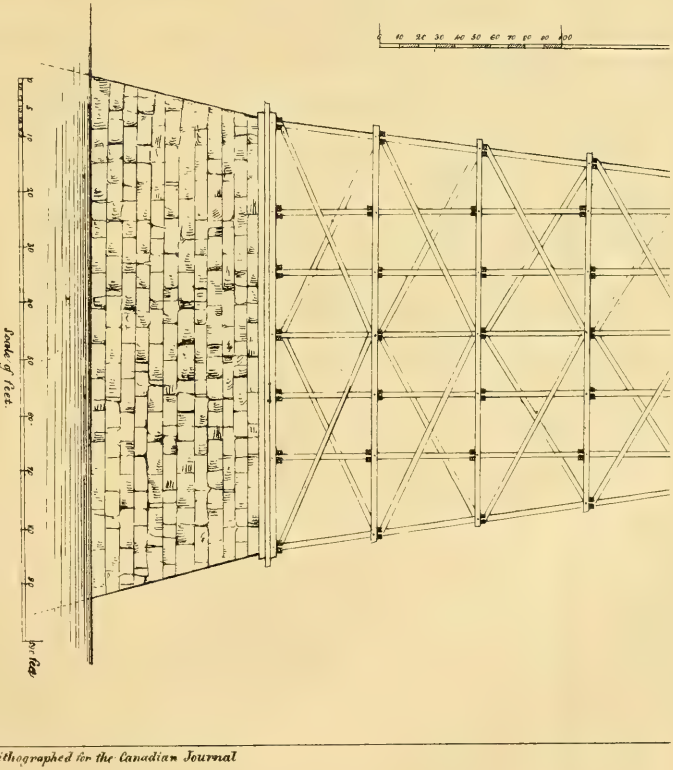

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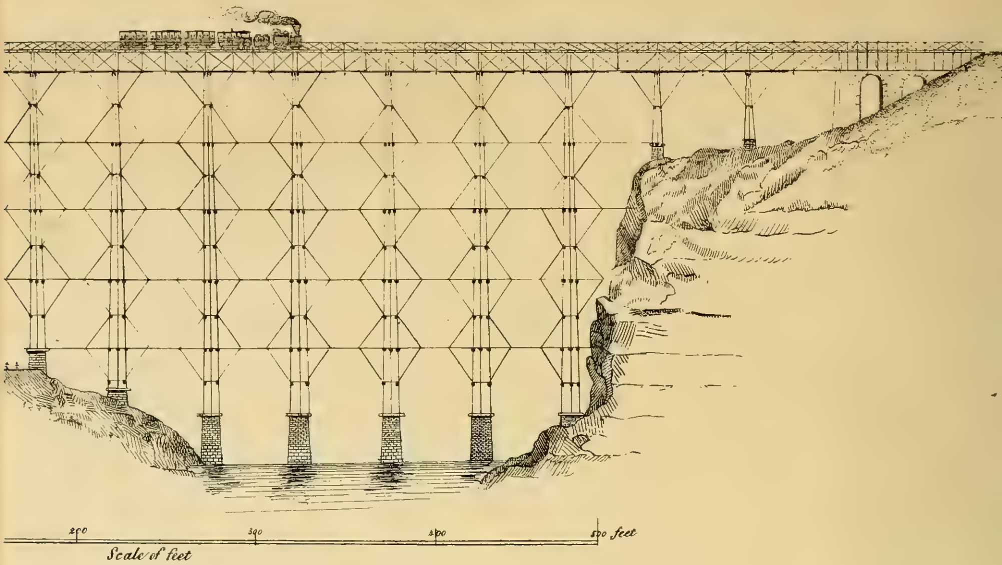

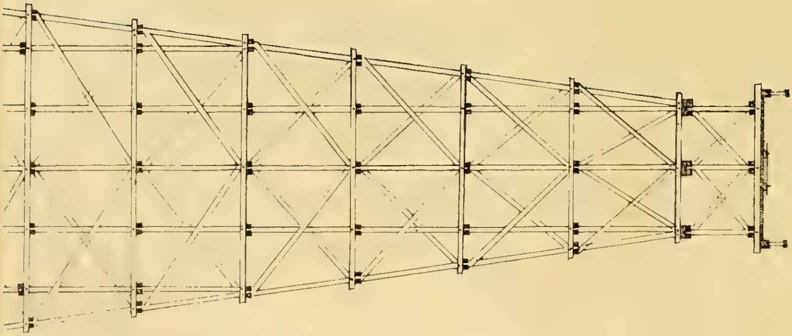

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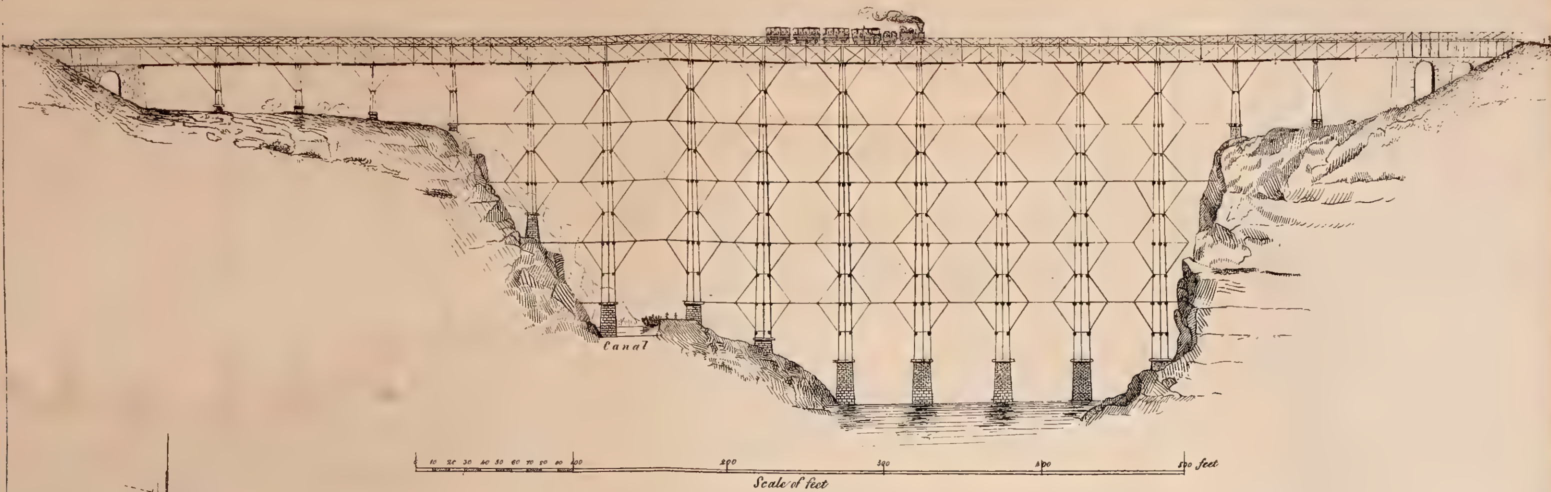

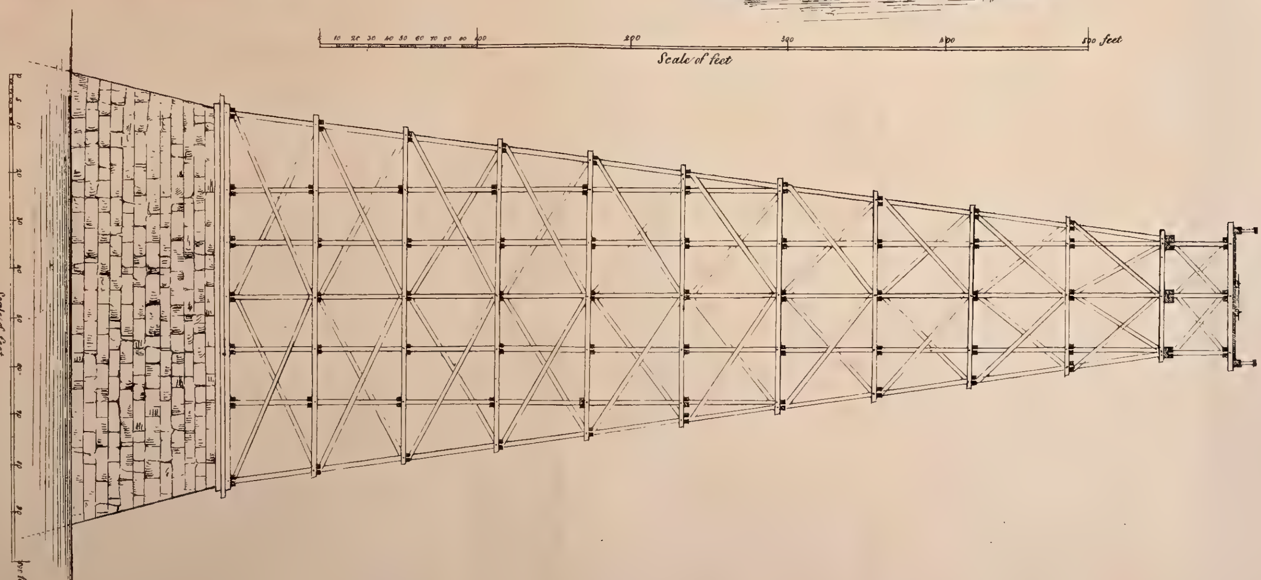

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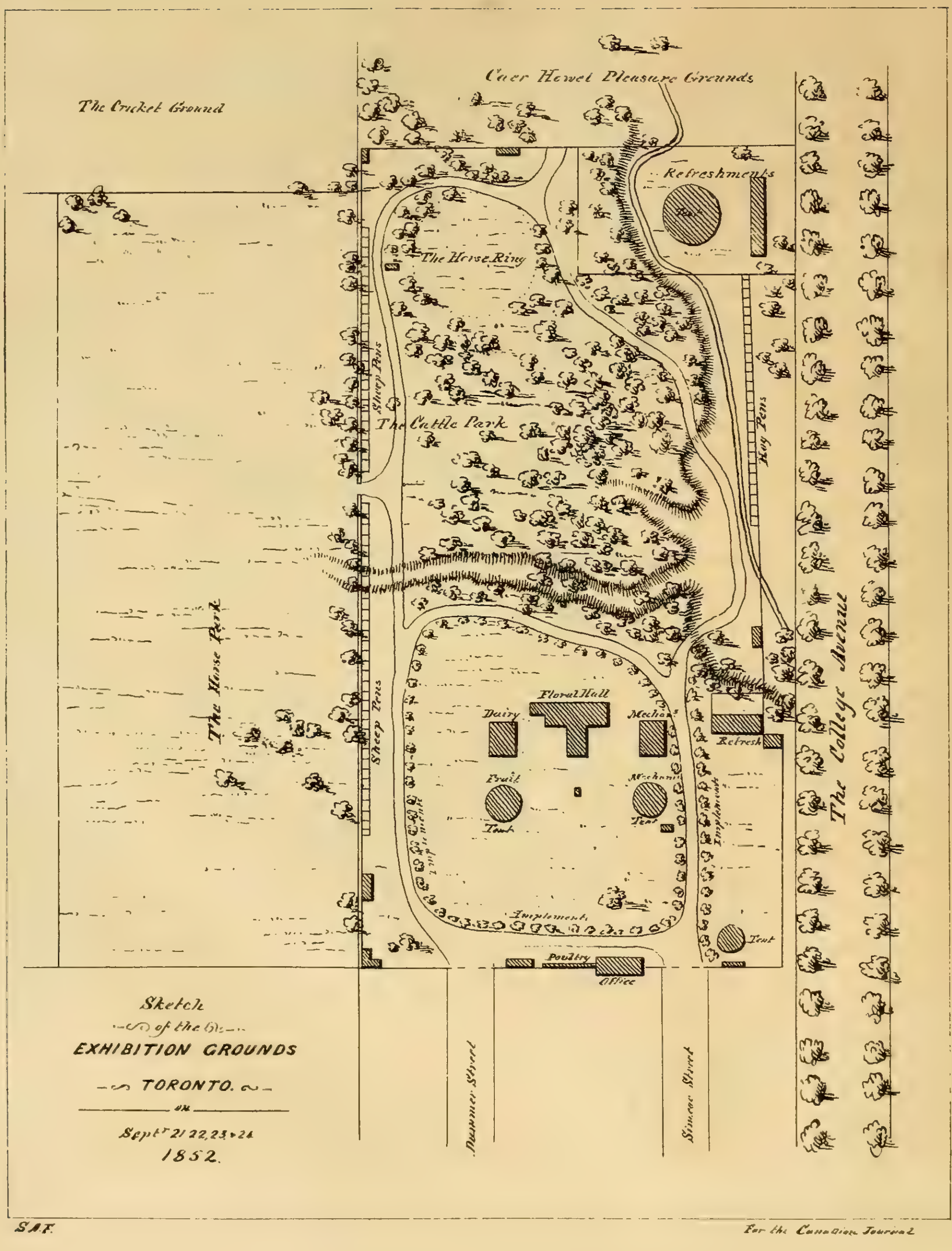

Caer Howel Pleasure Grounds
The Cricket Ground
Refreshments
Tent
The Horse Ring
Sheep Pens
The Cattle Park
Hog Pens
The Horse Park
Floral Hall
Dairy
Mechan.s
Refresh.
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Mechanics
Tent
Implements
Implements
Implements
Tent
Poultry
Office
The College Avenue
Dummer Street
Simcoe Street
Sketch
of the
EXHIBITION GROUNDS
TORONTO.
on
Sept.r 21 22, 23 & 24
1852.
S.A.F.
For the Canadian Journal

INCORPORATED BY ROYAL CHARTER.

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Beard, Charles, G. W. R.	"
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Bell, Rev. George	Simcoe.
Bell, Rev. Mr.	L'Orignal.
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Burgess, Dr.	Port Stanley.
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Chisholm, Rev. James J.	Lindsay.
Clark, John	Port Dalhousie.
Copeland, William	St. Catharines.
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Houghton, E.	Port Stanley.
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Ritchey, James	Simcoe.
Robinson, Christopher	Niagara.
Risler, Samuel	Toronto.
Roberts, David	Hamilton.
Roberts, J. George	Toronto.
Robins, S. P.	"
Sangster, J.	"
Shauly, Francis	"
Simons, Thomas M.	Hamilton.
Smallwood, ——	St. Martin's, Isle Jesus.
Stark, David	Coaticook, E. T.
Street, R. P.	Hamilton.
Unwin, Charles	Toronto.
Forrest, Wm. J., G. W. R.	Hamilton.

For the information of members, and for persons desirous of becoming members of the Canadian Institute, we subjoin a few extracts from the Regulations and Circulars which have been published by the Council.

1. The Canadian Institute has been established by Royal Charter, for the purpose of promoting the physical sciences, for encouraging and advancing the industrial arts and manufactures, for effecting the formation of a Provincial Museum, and for the purpose of facilitating the acquirement and the dissemination of knowledge connected with the Surveying, Engineering and Architectural Professions.

2. There are three classes of persons who may, with propriety, join the Institute. 1st. Those who, by their attainments, researches, or discoveries, can promote its objects, by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal* (which will be furnished to members of the Canadian Institute without charge,) and an acquaintance with the improvement in Art and the rapid progress of Science in all countries,—a marked feature of the present generation. 3rd. Those who, although they may neither have time for, nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and, to say the least, a patriotic undertaking,—a wish to encourage a Society where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the members of the Canadian Institute than the means, the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

3. The first contribution of each member shall be the sum of one pound. The following annual contribution of each member shall be fifteen shillings. The first contribution of each shall be payable at the time of his election, and the second shall become

due in advance on the first day of January, in the next following session after that in which he was elected.

4. The sessions of the Institute shall commence annually on the first Saturday in December; and ordinary meetings shall be held on every succeeding Saturday (omitting the Christmas holidays) until the first Saturday in April; but it shall be in the power of the Council to protract the sessions, if it should seem necessary. The chair may be taken when five members are present.

5. A general meeting of the Institute shall be held annually, on the second Saturday in December, at seven o'clock in the evening, to receive and deliberate upon the report of the Council on the state of the Institute, and to elect the officers and members of the Council for the ensuing year.

6. Persons desirous of being admitted into the Institute as members, are requested to communicate with the Secretary.

The Canadian Journal.

TORONTO, OCTOBER, 1852.

The Provincial Agricultural Show.

In our present attempt to furnish the Canadian public with an illustrated narrative of the Provincial Agricultural Fair, recently held in the city of Toronto, we have earnestly endeavoured to keep in view two important objects, which can alone succeed in giving to our descriptions and criticisms the practical value we hope they will possess.

The position of the *Canadian Journal* in relation to the public, fully warrants us in striving to accomplish a task of acknowledged difficulty, without the suspicion of being biassed by any fear of reproach, or desire to secure individual favour or support.

It has been our aim to give, first, a truthful description of each department of the Show; and secondly, to suggest, where occasion offered, changes and improvements which appeared to be important and useful.

The scene of an event so interesting to Canadians as that of our annual Exhibition of Industry, requires in the present instance a special notice; we shall take, therefore, a preliminary glance at the history of the Capital of Upper Canada, together with those collateral stages of progress and development which appear to distinguish the advance of the Western Province in a very note-worthy manner.

But few, perhaps, among the thirty thousand visitors to the Exhibition ground on Thursday, September 23rd, permitted their thoughts to wander back to the time when the spot, so densely occupied by the "pale faces," and crowded with their works of patient industry and skilful art, was a wild and marshy forest, tenanted only by a few wandering Messassaugas; or, at a later date, and in the memory of numbers then present, the forest suburbs of a village, which numbered but a few hundred enterprising settlers.

Sixty years ago, an Indian wigwam stood alone on the spot now occupied by a city containing thirty-two thousand inhabitants, and furnished with nearly all the requirements of modern civilization, and much of the energy and skill which characterizes the age.

Sixty years ago, the population of Upper Canada consisted of a few thousand families, dispersed over a territory containing upwards of forty-six thousand square miles, enjoying but a very limited means of communication between themselves, and deriving few advantages from a chequered intercourse with the world beyond their own great lakes.

At the time we write, this extensive province is peopled with one million freemen, in possession of those civil and religious blessings which can alone be won and enjoyed by an enterprising and vigorous people.

Surprising and even wonderful as this progress may seem to be, it is but an illustration of that onward movement common to the vast expanse of territory on this continent occupied by the races whose mother tongue is the one in which we write.

It is, however, a most favourable illustration, for if Upper Canada were to be compared with the

> "Thirty noble nations
> Confederate in one,"

which lie to the East and the South, she would distance in point of population twenty-two of their number, and in much that ennobles and elevates a nation, she would probably throw a greater number into the shade. The population of Upper Canada has doubled itself within the last ten years, so also has the population of Toronto. The improvements which have taken place during that period, both in the Province and her capital, have increased in a tenfold greater ratio.

To confine ourselves more especially to Toronto, we may perhaps furnish without exhausting the patience of our readers, a few facts which will shew the direction this remarkable progress has taken.

In place of almost impassable roads during the spring and autumnal periods of the year, cutting off "Muddy Little York" from the surrounding thinly-settled country, not much more than twenty years ago, we find now, radiating from Toronto,—itself a city of one hundred streets,—hundreds of miles of excellent macadamised and plank highways; three different lines of railway in various stages of completion; eighty licensed cabs for the convenience of the citizens; a score of omnibuses and well-appointed stages for country travel; numerous steam-boats frequenting the harbour; direct communication by water, eastward, with the great highway of all nations—the ocean; equally uninterrupted access, westward, to eight States of the Union without breaking bulk, and lastly, instantaneous communication with Quebec, New York and New Orleans, together with most of the intermediate cities.

Not many years ago, the ground recently occupied by the Provincial Agricultural Show, was a forest-covered tract, and regarded by the citizens of York as altogether "in the country," and so inaccessible that when the late Hon. D'Arcy Boulton built the house in the field adjoining the clover pasture where the

horses where exhibited, his *city* friends in amazement asked, "who does he expect to visit him in that outlandish place." The most romantic believer in the future splendid destiny of Toronto, would have scarcely dared to suppose, that in one short generation, the forest wild would have become the judiciously chosen spot for a Canadian Provincial Show, to which many hundreds of exhibitors contributed specimens of their industry or art, and to allude to one department only—but one which above all others stamps, perhaps, the character of an agricultural people, namely, farming stock,—of such individual and collective excellence were the animals exhibited, that the President of the New York State Agricultural Association publicly acknowledged their superiority to the specimens shown at the late fair of the Empire State.

These are facts which speak volumes for the progress of Toronto, and scarcely less for the hand-in-hand development of the magnificent province of which she is the capital, and from which she has derived her present imposing position and stores of solid wealth.

We must not forget, however, that Upper Canada owes much, very much, to her admirable position for commercial intercourse, her bountiful soil, and her salubrious climate—three glorious gifts which nature has showered lavishly upon her, and which must always be present to our view when we would truly estimate the industrial and social position of her inhabitants.

One of the most valued lessons taught to the British people by the Great Exhibition of all Nations, was an acquaintance with their own ignorance of numerous artifices and processes familiar to the manufacturers and artizans of other competing nations.

To compare small things with great, but to ourselves of highest importance, what are the lessons which the late Exhibition at Toronto is to teach the people of Canada?

Striving among ourselves, we can only form an estimate of individual excellence in a contracted sphere. To arrive at a useful appreciation of our merits and demerits, we must have a more exalted standard of comparison, and turn to a world-wide field where competition is a struggle between giants; there alone shall we be able to ascertain whether there has been brought to bear upon our works of industry and art that general knowledge and practical skill which distinguishes true progress from energies improperly directed.

We now proceed to give a general description of the show-ground, and shall afterwards advert more in detail to the particular departments of the Exhibition.

View of the Show Ground.

The ground enclosed for the purposes of the Show contained an area of about seventeen acres, exclusive of the horse parade; its form was that of an oblong, nearly equally divided into two parts by a winding but shallow ravine, through a part of which a running stream of water found its way. The southern half of the ground was quite clear of trees, with the exception of one or two noble elms, stately records of the forest which a few years since covered the spot. The northern half of the enclosure was prettily wooded with second growth timber, which afforded an admirable park for the display of numerous varieties of cattle collected in groups under the shade of the trees. A circular open space near the northern boundary of the enclosure was originally intended for the horse parade, it was found, however, to be much too small for that purpose. The horses were exhi-

bited in a field, the property of Mrs. Boulton, adjoining the enclosed ground, and marked on the plan "The Horse Park." The Toronto Cricket ground and the pleasure grounds of Caer Howel formed the northern boundary of the Show ground. Upon the smooth bowling green attached to Caer Howel a large refreshment tent was erected, in which the Judges and Officers of the day breakfasted before proceeding to their allotted duties. Upon the east side of the enclosure the noble avenue leading to the spacious and ornamental grounds of the Toronto University, offered entrance to and exit from the Show grounds, through Caer Howel. The carriage drive round the open half of the enclosure set apart for the display of agricultural implements, was well marked out by small pine trees, which added greatly to the pleasing effect of the whole.

The buildings erected by the Local Committee for the display of those articles which would have been injured by exposure, were five in number, the Fine Arts Hall, the Floral Hall, the Agricultural Hall, the Mechanic's Hall, and a small building attached to the Fine Arts Hall for the display of School apparatus. In front of the Mechanic's and Agricultural Hall two magnificent tents were placed for the display of Horticultural and Agricultural specimens, and specimens of Mechanical industry, which could not be conveniently arranged in the buildings designed to receive them; and well it was that these auxilliaries were obtained from our American friends, otherwise the buildings erected for the reception of articles would have been so crowded as to render inspection an impossibility. Even with the large amount of additional space obtained by the erection of the tents, into which articles not easily spoiled by exposure were placed, the halls were found far too small for the display of the industrial products which filled them to excess. In the open space before the halls and tents a large and varied assortment of implements covered a considerable portion of the area; Machines of Canadian construction occupying the inner portion of the area, bounded by the carriage road; the Foreign implements covering the space between the road and the eastern fence, as shown upon the plan.

Along the southern fence, ticket offices, committee rooms, pens for poultry, &c., and refreshment booths were arranged, together with the entrance and exit gates. The horse park was well adapted for the display of the eighty noble looking animals which were at one time assembled in it. The thanks of the Local Committee were tendered to Mrs. Boulton for the liberality that lady exhibited in placing the field at their disposal.

Numerous varieties of sheep occupied between fifty and sixty pens, constructed against the western portion of the fence. The pigs were disposed upon the opposite side of the grounds near to Caer Howel.

The general appearance of the Show Grounds during the whole of Thursday and Friday was remarkably striking; outside of the high fence enclosing them it was not less so, and at one time it threatened to be more animated than agreeable, indeed, at about 10 o'clock on Thursday grave fears were entertained that the fence would not have been able to sustain the pressure of the vast body of people anxious to obtain admission, and delayed by the necessity of giving up their tickets to the constables in charge of the narrow entrance door-ways, of which there were but two. Eighteen thousand single tickets were sold on Thursday, besides upwards of two thousand members badges, which admitted the member and his family.

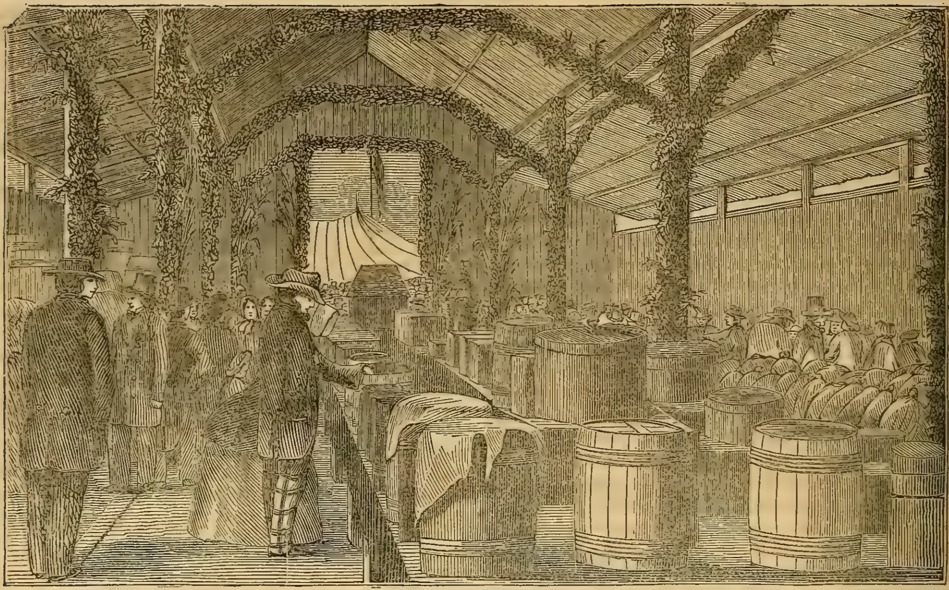
We were also informed that no less than eleven hundred vehicles passed through the toll-gate situated on Yonge Street, in the immediate neighbourhood of Yorkville, on Thursday the 23rd September. This number does not include those which entered Yorkville by the Davenport plank road, which may be estimated at three hundred more, thus making a total of fourteen hundred vehicles entering Toronto by the great northern road in one day.

However delightful it must have been to every well wisher of Upper Canada to witness the very large display of almost every kind of Agricultural produce and implements, yet it was evident to all who visited the ground that the arrangements of the Local Committee were made on much too contracted a scale. We question whether one-tenth of the curious who thronged the halls, conveyed away any distinct impression of the merits and peculiarities of their contents, neither do we suppose that one-tenth part of the solid and practical information which such an agricultural show was eminently calculated to inculcate, could have been received by the thousands who came not only to see but also to learn. In relation to this subject, we were glad to notice that some steps are about to be taken by the Board of Agriculture, which will unquestionably be attended with benefit if proper use is made of the advantages which may be expected to accrue from the recognition of the principle contained in the subjoined resolutions, which were submitted to the meeting by Angus Cameron, Esq. of Kingston, and referred to the Board of Agriculture for further consideration:—

"That it would be of great importance to the interests of Agriculture throughout the Province, that each county should be enabled to erect buildings for the purpose of receiving and protecting all such productions as may be exhibited at County Shows, rather than continuing the present practice of erecting temporary buildings at great expense, and removing them after a few days use.

"That it be recommended that the President of the Association and Board of Agriculture memorialize the Governor General in Council, to appropriate a sum of money, not less than £250 to each county, for the purpose of procuring land whereon to hold their annual exhibitions and erect buildings. This boon from the Government to be conferred only on such counties as shall procure by subscriptions an equal amount for the purpose of erecting such buildings as may be required."

We do not presume to offer any opinions as to the mode in which future arrangements for County or Provincial Agricultural Shows should be carried out, but we are well pleased to see that the subject is under the consideration of the Board, and trust that some measures may be adopted which will obviate many of the difficulties, and lessen many of the disappointments which so frequently accrue from defective arrangements in our annual expositions of industry. We think too, that if permanent buildings for County Agricultural Shows were erected, a great step towards the establishment of a County Agricultural Museum would be gained, the most feasible method of instructing the people at large in those artifices and contrivances which distinguish the progress of the age, and are now so necessary to success.



The Agricultural Hall.

Each side of this building was divided into seven compartments, four of which were entirely filled with competitors' samples for the great prize of the day. The very large quantity of wheat entered for the Canada Company's prize—consisting of not less than twenty-three samples of five-and-twenty bushels each—occasioned much crowding in the grain department. It was however very pleasing to witness the large accumulations of sacks containing the staple production of Canada, a quantity which might well have occupied one-half more space than could be allotted to it in the Agricultural Hall. In the compartments next to those in which the wheat for the Canada Company's prize was stowed, the two bushel samples of fall wheat were arranged in order, then came specimens of spring wheat, oats, barley and rye. Marrowfat and common field peas occupied the last compartment on the west side of the Hall. On the east side numerous specimens of various kinds of potatoe, some of a size we have seldom seen surpassed, filled the first and second compartments. After these were placed bales of hops, flax in the raw and manufactured state, &c. The next two spaces were filled with very neat specimens of flour in barrels, all exhibiting exteriorly, much neatness and care in workmanship and some aiming at a style of decoration which though showing a praiseworthy endeavour to attract public attention, yet seemed scarcely in keeping with the homely nature of their contents. We do not think that the very useful yet common-place article, flour, requires to be placed in a varnished barrel, even in an Agricultural Hall. We think that the objection which so many urge against *gilded* ploughs obtains with equal force in the case of varnished flour-barrels. The succeeding compartments were filled with turnips, khol-rabi, mangel-wurtzel, Indian corn, cattle carrots, field beets, and broom corn. Between the compartments on the east side, large cattle squashes placed on dividing shelves, occupied a prominent position.

The centre of the Hall was occupied by a large table, about fifty feet in length by six broad. In the middle of the table a raised platform eighteen inches in breadth served to exhibit various articles to which we shall afterwards allude. The supports of the roof of the building were very tastefully decorated with the ever-green hemlock, which gave to the general appearance of the whole, a rustic and even graceful finish.

Reposing upon the table, the first object which attracted the attention of the visitor, was an enormous cheese, weighing 658 lbs., from the dairy of Mr. Ranney of Dereham, County of Oxford. Other cheeses of smaller dimensions were exhibited by the same gentleman. We were told that they were a portion of the produce of 126 cows, which constitute Mr. Ranney's dairy. The monster cheese was backed by two bee-hives, one merely a model, the other filled with a rich store of honey and comb. Several other hives of less pretending dimensions, but enlivened by hosts of living occupants, were arrayed on one side of the larger hives. We were glad to see these little industrious communities so well represented; no Canadian farmer should consider his farm properly stocked until he has secured a good hive of bees. Specimens of foreign oats, Canadian tobacco, and several varieties of British wheat succeeded the bees, and were themselves preceded by numerous bags containing turnip seed, while beans, clover seed, flax seed, timothy seed and hemp seed followed, up to the top of the

table. At one side of the entrance two barrels of bone-dust, of different degrees of fineness, showed that attention is now being directed by our farmers to the subject of special manures.

Butter in numerous kegs, firkins, pots and dishes, occupied about one-half of the east side of the table and elevated platform, the remaining portion being filled with a pretty large variety of cheeses, including the Stilton from the dairy of Ralph Wade, jun., Cobourg.

The narrow platform in the centre of the table was covered with samples of biscuits, maple sugar, a model straw stack, manufactured chicory, &c. At the south entrance of the hall we noticed some splendid specimens of Indian corn growing in boxes, some of the stalks of which could not be less than fourteen feet high.

Although we were very favourably impressed with the satisfactory evidence, offered by the contents of the Agricultural, Hall of the progress of husbandry in the Province, yet in some instances our expectations were not fully answered. The show of roots was very defective, the specimens exhibited were few in number and generally not distinguished by those excellent peculiarities of size and figure which one expects to meet with in Agricultural shows. The grain was unquestionably good, a splendid evidence of the admirable adaptation of our climate and soil to the growth of the cereals. The display of butter and cheese was not large, nor, if we except Mr. Ranney's monster cheeses, and Mr. Wade's excellent Stilton and double Gloucester, not particularly noteworthy, either in appearance, quantity or quality. We looked in vain for many varieties of vegetable produce which should especially engage the attention of the farmers of this magnificent Province. To advert to two classes of agricultural plants only, viz., dye plants and oil plants; why are their representatives absent from our annual exhibitions? It is true that hemp and flax are gradually coming into favour, and thanks to the Canada Company, they will soon, we hope, become a staple article of growth and manufacture; but, where were the specimens of oil from their seeds, from the white and brown mustard, and the sun flower; where was the oil cake for feeding cattle? And respecting dye plants, the bastard saffron, yielding the rich Turkey red, and of which upwards of $2,000,000 worth is annually produced in the neighbouring States, found not a place in the exhibition nor in the prize list. Madder was alike unrepresented, and others which might profitably be introduced into our exhibitions.

In glancing at the prize list, after the awards were published, we were surprised to find that, in some instances, three prizes were given to one individual for specimens of the same description of article, in other cases but one prize was awarded, although there appears to have been no competition, and yet two or three prizes offered by the Association. We think the regulations for the entry of articles for competition should limit the exhibitor to one specimen of each kind. Under present arrangements, it appears to us that a successful cultivator of any variety of vegetable may secure to himself the whole of the prizes offered for any one article, by sending to the exhibition as many specimens as prizes. Every one knows how frequently it happens with field produce, that where you succeed in obtaining one bushel of fine roots or seeds, you may generally select half a dozen very little inferior to the one designed for exhibition.

The regulations for the guidance of Judges do not appear to be sufficiently explicit; and we feel sure that the very existence of any description of rules could not have been credited by the Judges of Ayrshire Cattle. In their report to the Association they state that,—

"The Judges of Ayrshire Cattle beg to submit their regret at the limited competition in this class of animals, there being only twenty-one entered for twenty-four prizes. The competitors were also few. The Judges, if they had the option, would not have awarded all the prizes when there were so few competitors. In the class of Cows, for instance, all were owned by one gentleman. The undersigned respectfully suggest the expediency of leaving to the discretion of Judges in future to withhold prizes under such circumstances, unless in case of very superior merit in the animals exhibited."

The report was presented in the face of the subjoined regulation of the Association attached to the prize list:—

"8th. In the absence of competition in any of the Classes, or if the Stock or Articles exhibited be of inferior quality, the Judges will exercise their discretion as to the value of the premiums they award.

Many discrepancies also occur in the award of discretionary prizes; some Judges are inclined to be too liberal, others too exacting. Prizes are awarded because an article possesses novelty, or exhibits ingenuity, though without profitable application, or shows a disposition on the part of the contributor to add to the interest of the show, or evinces sharpness and energy in advertising his wares, &c. &c.

We are inclined to question the propriety of awarding a prize to Bride Cake, to Soda Biscuits, to specimens of Biscuit baking, with the name of the manufacturer in broad letters on his boxes, to Four Reversible Coats and one pair Pants, to an assortment of Wigs, or to an Over-coat, all of them articles which are unquestionably very useful and creditable in their way, but which scarcely have a right to come in for a share of the prize money of the Agricultural Association.

We would respectfully urge upon the Association the propriety of preparing and publishing a series of regulations for the especial guidance of Judges. They should be printed upon the first page of each prize book placed in the hands of the Judges before going their rounds; and they should be of such a general character as to make them applicable to our county as well as to our Provincial Expositions of Agricultural Industry, thus leading to that uniformity and exactness which is so greatly to be desired.

AGRICULTURAL PRODUCTIONS.

JUDGES—Jos. Webster, James Williams, James L. Green, James Crawford, Wm. Matthie, Thos. Hatt, James Wright, James Regers, J. P. Gage.

The Canada Company's Prize of £25.

For the best 25 bushels of Fall Wheat, the produce of Canada West, being the growth of the year 1852. The prize to be awarded to the actual grower only of the wheat, which is to be given up to, and become the property of the Association, for distribution to the County Societies for seed. J B Carpenter, Townsend, £25; 2 (by the Asso-

ciation) Robert Turnbull, Dumfries, £10; 3, Isaac Anderson, West Flamborough, £5.

Two bushels Winter Wheat.

1, Lewis Mills, West Flamborough, 2*l* 10s; 2, John Smith, West Flamborough, 1*l* 15s; 3, B Johnson, Etibocoke, 1*l* 5s.

Two bushels Spring Wheat.

1, W. Forfar, Scarborough, 2*l* 10s; 2, W. Patterson, Scarborough, 1*l* 15s; 4, J. Smart, Darlington, 1*l* 5s.

Two bushels of Barley.

1, P. R. Wright, Cobourg, 1*l* 10s; 2, I. Anderson, West Flamborough, 1*l*; 3, Alexander Shaw, Toronto, 10s.

Two bushels of Rye.

1, J. Lafferty, Toronto, 1*l* 10s; 2, do, do, 1*l*; G. Anderson, West Flamborough, 10s.

Two bushels of Oats.

1, J. Stodders, W. Gwillimbury, 1*l* 10s; 2, P. Wheeler, Scarborough, 1*l*; 2, J Guinty, West Gwillimbury, 10s.

Two bushels of Peas.

1, W. Gordon, Whitby, 1*l* 10s; 2, W. Parson, York, 1*l*; 3, John Dew, York, 10s.

Two bushels of Marrowfat Peas.

1, W. Gordon, Whitby, 1*l* 10s; 2, Henry Jennings, Markham, 1*l*; 3, Captain Shaw, Toronto, 10s.

Two bushels of Indian Corn in the ear.

1, W. M'Micking, Stamford, 1*l* 10s; 2, do, do, 1*l*; 3, Baron de Longueuil, 10s.

Bushel of Timothy Seed.

1, S. Mills, West Flamboro', 1*l* 5s; 2, T. Snider, York, 15s; 3, Isaac Anderson, West Flamboro', 10s.

Bushel of Clover Seed.

1, Thomas Snider, York, 1*l* 10s; 2, B Mitchell, Darlington, 1*l*; 3, W. Early, Esquesing, 10s.

Bushel of Hemp Seed.

1, Alexander Shaw, Toronto, 1*l*; 2, do, do, 15s; 3, J Fewster, Whitby, 10s.

Bushel of Flax Seed.

1, Alexander Shaw Toronto, 1*l* 10s; 2, J. Dew, York, 1*l*; 3, Abel Wright, Bathurst, 10s.

Swedish Turnip Seed.

1, J Stuart, Darlington, 15s; 2 R. Allen, Darlington, 10s.

Bale of Hops, 112 lbs.

1, J. Ritson, Oshawa, 2*l* 10s; 2, W. McGrath, Toronto Township, 1*l* 10s; 3, J. B. Belton, London, 1*l*.

Bushel of Potatoes.

1, B. Johnson, Etobicoke, 15s; 2, J. Hogg, York, 10s; 3, Thomas Snider, York, 5s.

Bushel of Swede Turnips.

1, Lewis Bate, 15s; 2, P. Armstrong, Toronto, 10s; 3, do, do, 5s.

Bushel of White Globe Turnips.

1, P. Armstrong, Toronto, 15s; 2, R. L. Denison, Toronto, 10s.

Bushel of Aberdeen Yellow Turnips.

2, P. Armstrong, Toronto, 15s,

Bushel of Red Carrots.

1, Baron de Longueuil, Kingston, 15s; 2, P. Armstrong, Toronto, 10s; 3, D. Falkner, Toronto, 5s.

Bushel of White or Belgian Carrots.

1, J. Sisley, Scarborough, 15s; 2, W. Wilson, Etobicoke, 10s; 3, do. do., 5s.

Bushel of Mangel Wurtzel, Long Red.

1, J. Sisley, Scarborough, 15s; 2, Coxswell, Toronto, 10s; 3, James Shaw, Toronto, 5s.

Bushel of Yellow Globe, Mangel Wurtzel.

1. Baron de Longueuil, Kingston, 15s; 2, Mrs. S. A. Boulton, Toronto, 10s; 3, R. Stibbard, York, 5s.

Twelve Root of Khol Rabi.

1. W. Gordon, Toronto, 10s; 2, Professor Croft, Toronto, 5.

Bushel of Sugar Beet.

1, Baron de Longueuil, Kingston, 15s; 2, Alexander Shaw, Toronto, 10s; 3, R. L. Denison, Toronto, 5s.

Bushel of Parsnips.

1, Baron de Longueuil, Kingston, 15s; 2, J. Orford, Toronto, 10s; 3, Mr. Parrir, Toronto, 5s.

Four largest Squash for Cattle.

1, Alexander Shaw, Toronto, 15s; 2, Robert Baldwin, Toronto, 10s; 3, F. Taylor, Davenport, 5s.

Twenty lbs. Manufactured Tobacco, Growth of C. W.

George Lewis, Toronto, 1*l*.

Broom Corn Brush, 28 lbs.

1. Alexander Shaw, Toronto, 1*l*; 2, do., 15s; 3, do., 10s.

The Canada Company's Prize for Flax.

1, Best 112 lbs of Flax, R. L. Dennison, 6*l*. and diploma; 2, (by the Association) J. Fewster, Whitby, 3*l*. 10s; 3, A. Wright, Bathurst, 1*l* 10s.

Canada Company's Prize for Hemp.

Best 112 lbs of Hemp, J. Fewster, Whitby, 4*l*; 2, (by the Association) do, do., 2*l*. 10s.

Agricultural Machinery and Implements.

In Agricultural Machines were to be found ploughs, drills, harrows, reaping and mowing machines, chaff and straw cutters, grain and root crushers and cutters, thrashing machines of various construction, agricultural horse-power, (occupying wonderfully small space for the power exerted,) cultivators, fanning mills, churns and cheese presses, and various other labour-saving machines; a clover seed gatherer; a cross-cutting saw mill also attracted particular attention. All these machines bore a high stamp of excellence, and were not surpassed by those of English and American make. The subsoil plough was, in the foreign department, prominent, thus shewing a decided approval of the latest improvements in English and Scotch agriculture; there were wanted but the draining plough, and draining tile and pipe machine to represent the latest and most permanent improvements which British ingenuity has produced in her struggle against the world.

Though not evincing so great an improvement over former exhibitions as we had hoped to see, the collection of Canadian Agricultural Machinery presented many encouraging facts to our notice; and chiefly so is the very favourable manner in which it compared with similar productions exhibited by our neighbours. It has been generally admitted, though almost without enquiry, that the older hands on the "*other side*," as a matter of course, produce implements so superior to those manufactured in Canada as to put all attempts at successful competition out of the question. It is to be regretted that our mechanics have so long tacitly admitted the truth of that assumption; it needed but an impartial examination of the machines exhibited last month to prove its fallacy, and to demonstrate that we need but a fair field—and no favours—beyond a fair trial, to enable us of Canada to compete successfully in the manufacture of Agricultural implements with our older established brethern across the border. Let us not be understood here as repudiating our obligations to our very energetic neighbours: we owe them a *turn* for rubbing off our rusty spots.

The Reaping and Mowing Machines exhibited by Mr. Helm of Port Hope are, to our mind, fully equal to the imported ones of M' Cormick, Hussey & Ketchum, whether considered in reference to their mode of operation, or the workmanship displayed in their construction.

The Ploughs exhibited were numerous, and displayed a fair amount of mechanical skill in their construction, as well as a

great deal of judgment in adapting the forms of their mould boards and other parts to the attainment of an easy draft and a perfect performance of their duty. The best form for the attainment of these points is not, we believe, very well defined, and is one of those problems which has to be solved by the practical man without the aid of mathematical formulæ. As a natural consequence of this, a great many crotchets are advanced without much reason. Among Wooden Ploughs we would point out Mr. Hurlburt's of Prescott, Mr. Modland's of Etobicoke, and the Messrs. McTavish of Darlington, others were also well deserving of notice. The Iron Ploughs by McSherry of St. David's, and Dunbar's of Pickering, were good examples. We could not admire the armorial bearings (?) nor (loyal though we be) the Union Jacks painted on the mould boards of some of the ploughs. Painted ironwork, when exhibited as a sample of workmanship, is an abomination, and to our mind only suggestive of concealed flaws—we had rather bear with the rust.

We did not see any Subsoil Ploughs among the Canadian implements; it is a blank which we trust will be filled next year; there were several among the American articles, and denoting, as their use does, a great improvement in agriculture, we shall be pleased to see evidence of their manufacture in Canada, as indicative of a sufficient demand to render them worthy the attention of our mechanics. We know that they are used on some farms in Canada,—we wish to know that they are manufactured here.

The Cultivator, though an important implement, was not well represented. A very good one of its class was exhibited by Mr. Sampson of St. Catharines, another by Mr. Brown of Bowmanville was a fair article.

The same may be said of Harrows, we did not see any worth referring to.

Drills are not yet so widely used in Canada as to warrant the expectation of much variety in that class of implements; we were therefore much pleased to see those exhibited, giving evidence of a demand for them. Next to the Plough, they are the most valuable of all the implements used on the farm, though on half cleared lands many obstacles exist to their being adopted, still, a great extent of country is now advanced to that state of cultivation which will warrant their introduction, and this should induce our machinists to give them their attention. None of those on the ground realized our idea of what a Grain drill should be, but we would point to one exhibited by Thomas Haggart of Chinguacousy as a fair sample.

The Horse Rakes made a poor show as to number. We think they would have been found improved in quality if our best makers had exhibited.

The usual variety of Horse-powers were on the ground, and showed some improvements in the details of their construction, as well as in workmanship; for light work, and where compactness is desirable, the railroad horse-power has our preference, as being very portable, and easily adapted to a variety of purposes.

The Field Roller by Mr. Becket, of Toronto, is a very good example of what such an implement should be; it is made in two lengths, an arrangement which very materially assists it in turning. A further division might, we think, be profitably copied from one exhibited by Rapelje, of Rochester. Mr. Becket's Garden Rollers were very good. The manufacture of these machines indicates that the advantages resulting from their use is understood by our farmers.

A Threshing Machine and Horse-power by Medcalf of Toronto, appears to leave but little to desire in this class of implements; the arrangement and character of workmanship is equal to anything we have seen. We much regretted the bad taste which induced the attempt at ornamental (daubing?) painting displayed on this excellent piece of mechanism; the real wood or plain white colours always look appropriate, while the wretched attempts which are sometimes made at imitating a mahogany panel on a Fanning Mill, with perhaps satinwood framing and rosewood mouldings, are truly distressing; in equally bad taste we noticed some Farm Waggons bedaubed with all the colours of the rainbow. Commend to us the mechanic whose work will bear inspection without such wretched aid. How well the natural grain of the tough ash, hickory, and oak, of some of the American machines contrasted with the gaudy colours of our own.

The Threshing Machine by Haggart Brothers, of Brampton, is a good article; and so is that exhibited by Sanderson, of West Flamborough. We think the *very long contrivance* for carrying off the straw is rather a far-fetched idea, and must add very much to the work of the horses, without giving any adequate advantage.

Among the Straw Cutters, which appeared in great variety, we would especially notice that exhibited by Butterfield, of Oshawa, as combining the very essential points of simplicity, strength, and facility for using. A great deal of useless complication is usually bestowed on these very useful machines, and we are pleased to see this successful attempt to simplify them. It may be driven through a belt or by hand. There were several others on the ground worthy of consideration, among them may be mentioned Seawright's and Humphrey's, both of Toronto.

The Farm Waggons displayed some good workmanship, with (as we have previously remarked) some very bad taste in the way of painting (daubing would be the most appropriate term).

A very ingenious machine was exhibited by a Mr. Wright, of Port Hope, for cross-cutting timber, which could be applied to a variety of purposes, as cutting stave lengths, shingle bolts, &c.; it was attached to a horse-power, and appeared to perform very satisfactorily, though, in our opinion, it is susceptible of many improvements in the details of its mechanical construction, without materially increasing its cost.

A Cheese Press and Curd Breaker, by John Amos, of Hamilton, though not distinguished for the mechanical skill displayed in it, is noticed in order to call the attention of our mechanics to this class of implements. With the same view we mention a Portable Cider Press, by J. Fergusson, Eldon, and we trust that next year we may have to notice a decided improvement in both.

A new opportunity for agricultural enterprize and a new article of export for the Province was pointed out by the introduction by the Canada Company of a Farmer's Flax Dressing and Scutching Machine, imported for the occasion, and, although from an accident which happened to it in its transit through the United States, it could only be seen in partial operation, yet it was in sufficiently good order to exhibit its value as a new article of domestic industry.

The importation of flax and hemp into Upper Canada alone, during the year 1851, was, according to the official returns, of the value of £15,987 15s. 7d., and when it is considered, that for both these articles the climate and soil of Canada is peculiarly suited, it cannot be doubted that these articles ought to be those of export and not of import.

The machine in question has also this peculiar excellence,—it enables the farmer within his own family and means, and during the unoccupied winter months, to reduce an article of growth into a staple fit for export or home consumption without going through the hands of a manufacturer. The average weight of flax straw grown on an acre of land varies from 2 to 3 tons; the seed is always eagerly sought after for the oil manufactory, and in the English and Canadian markets brings a good price.

The merchantable flax fibre produced by the machine in question averages one-fourth of the weight of the flax straw; the chaff and refuse is available for feeding cattle, and is equal to a similar weight of oat or barley straw. The flax to be dressed by the machine requires neither steeping or rolling, it is taken direct from the barn after being thrashed, and with a slight drying if damp, or in damp weather. is at once converted into a merchantable article for which cash is now paid in every town and city of Canada, and for which there is an almost unlimited demand in England. Armed with this machine, the Canadian farmer has not to fear the losses to which the Canadian manufacturer is at times exposed. The cost is not more than that of a common thrashing machine, the labour is entirely amongst his own family and hands, the machine is simple, easily repaired, and not likely to get out of order, and the extra profits on one year's crop will far more than pay the outlay and cost for obtaining it. Accompanying the machine was a pamphlet of full particulars and instructions, and a lithographic plan of the machine; these were distributed gratis to all comers, and can be obtained free of cost by applying to the Canada Company's Office in Toronto, where also the machine may be seen in full operation.

The liberal prize of £6 was given by the Company for the best sample of flax, and a sum of £4 for hemp, both of which were taken by Canadian farmers.

The liberality of the Canada Company in giving these prizes and the expense they have incurred in thus importing the flax machine, as well as their handsome prize of £25 for the best sample of Fall wheat, cannot be too highly spoken of, and it is believed, is fully appreciated by the public.

Near the Flax Machine, we noticed a beautiful piece of mechanism for plaiting Whips. We invite especial attention to it as suggestive of many complicated operations to which machinery may be applied with advantage. It was exhibited by Mr. Medcalf of Toronto.

The celebrated Montreal Fire Engine of A. Perry, which obtained a prize at the World's Fair, was on the ground. It is too widely known as a masterpiece of workmanship in its way, to need any eulogy from us—it fully merits all that has been said in favour of it.

Another very superior example of Canadian constructive skill was exhibited by D. O'Gorman, of Kingston, in a beautiful Skiff of 19 feet keel, made to pull two pair of sculls. Her model we consider faultless, and the workmanship equal to anything of the kind we have ever seen. She was built of Red Cedar and Butternut Wood, and not being painted, exhibited the grain of the wood and the excellent workmanship to good advantage. It may be interesting to some of our readers to know that O'Gorman has built skiffs in Kingston, to fill an order sent to him from Switzerland, one of which we fortunately saw safely shipped during the past season. It is said that equally good material is not found there and some gentleman being desirous to have the very best, commissioned a friend to procure them, who had been in Kingston, and who at once sent the order to O'Gorman.

The exhibition of foreign Machinery though not so much in advance of the home made articles as to give it that premium hitherto usually awarded to it, still exhibited some things worthy the attention of our mechanics, especially in the superior taste displayed in the finish of their work. The McCormick and Hussey reaping machines were conspicuous in this part of the exhibition and though circumstances have recently transpired in Scotland which go far to take from our neighbors the originality of the invention, they still claim our acknowledgements for introducing it here. (See *Canadian Journal*, page 39.) We look upon the Ketchum Mowing Machine as of fully equal if not superior importance to the farmer as the Reapers, especially to those who raise large quantities of Hay.

We noticed a "Gang Plough" which appears to be a very useful implement and exceedingly well made. We mention it as we did not observe a similar machine by Canadian exhibitors.

The Straw Cutter exhibited by Messrs. E. Taylor, Thomas & Co., of New York, claims notice chiefly from its novelty, and not in our opinion for any excellence it possesses over other varieties; indeed we think it inferior to many on the ground. It consists of a series of circular knives placed parallel to each other on an axis and entering the groves of an opposite cylinder, the latter being furnished with projections. The fodder is passed between the cylinder while revolving and is thus cut. There was one thing connected with it which we would commend to the notice of our Canadian manufacturers—namely, the perseverance of the persons exhibiting this machine in setting forth its superiority over all others, past or present. There is no denying but our neighbors are far ahead of us in this system of bringing their articles into notice. We were at a loss to obtain particulars of Canadian implements in many instances—no one appearing to own them or have any interest in them.

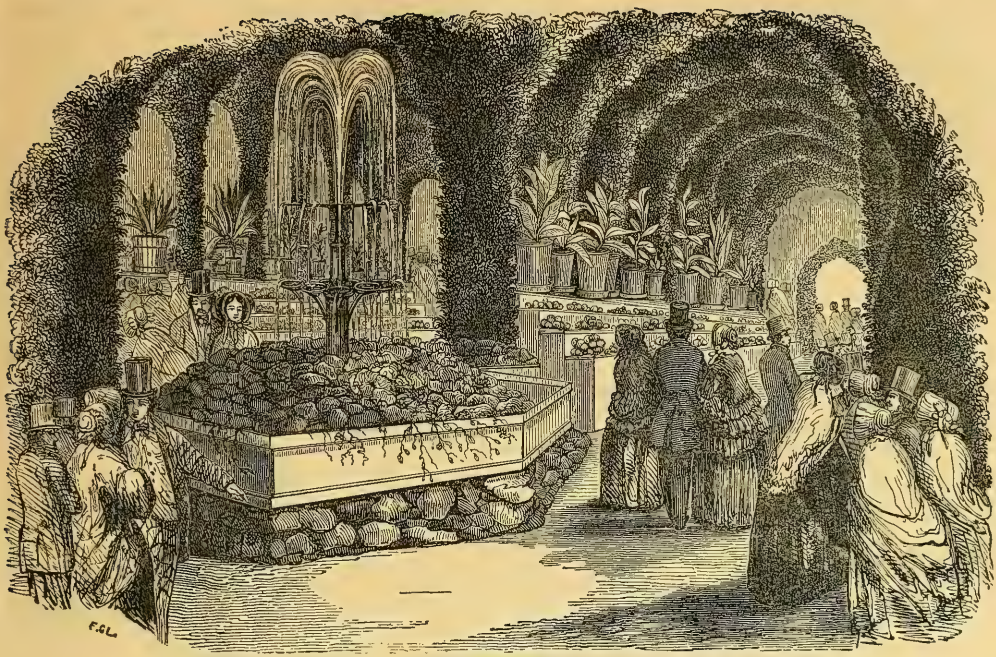
A Root Cutting Machine appeared well calculated to answer the purposes for which it was intended, and is worthy the attention of our mechanists as it must be an essential implement on farms where roots are raised for feeding cattle.

There were some very excellent cultivators exhibited,—that termed the Expanding Cultivator we consider the most generally useful.

There were some very useful Drills for a variety of purposes—the Grain Drill by Shipton we consider a very fair article. The Horse Powers did not present any new features to our notice; neither did the Fanning Mills, Grain Separators, &c. The Ploughs we did not consider as at all superior, indeed hardly equal to those exhibited by Canadians.

We would particularly commend to the more general attention of our mechanics a Tenoning Machine manufactured by Harding of Rochester; also a machine for working mouldings in wood by the same maker. They are of course chiefly of interest to the builder and cabinet-maker, to whom they must be great labour saving machines—as such, economising the production of articles which contribute to the comfort of all.

Of a very different class but still equally valuable, we would notice a machine for the preparation of hard bread, biscuit, crackers, &c., by Messrs. F. W. and T. Gage of Rochester. It is a very efficient machine and worthy of notice as an example of manufacturing skill.



The Floral Hall.

The internal decorations of the Floral Hall were simple, but very chaste and effective. The ceiling, or rather roof, appeared to be one mass of the delicate foliage of the hemlock, varied occasionally with festoons of silver poplar and the red berries of the mountain ash. The introduction of a fountain in active play during the exhibition, was a pleasing novelty, and greatly contributed to the numerous attractions of the Floral Hall. We are indebted to the *Family Herald* for the subjoined brief sketch of the contents of the Hall. Entering by the western door, on the right hand, the first display consisted of a large assortment of grapes, pears, peaches, plums, a few specimens of winter apples and a variety of green house plants, from Judge Campbell of Niagara. A little farther on were a beautiful specimen of the Alexander apple from Mr. Farrow, of Yorkville, some fine specimens of Hothouse grapes from W. H. Boulton's garden, and some very fine specimens of open air clingstone peaches from J. F. Smith of Yonge Street. The centre tier of the table and two adjoining shelves were covered with greenhouse plants and exotics, sent in by Mr. Fleming, Yonge Street. Mr. G. Leslie, Toronto Nursery, made a very fine display of apples, pears and plums, most of them only as specimens of the kind of trees they are cultivating, and are for disposal in their nursery. They exhibited 70 different varieties of apples, although they did not compete for so many, 30 varieties of different kinds of pears; 12 varieties of plums, one of which got the prize for the best variety. There were some beautiful coxcombs from Mr. Lewis of Yorkville, large and finely formed. Mr. Watson, farmer, Yonge Street, sent in a pretty plant of the Jerusalem cherry. Rev. Mr. Harris, of Yonge Street, exhibited some very good apples and pears, and Mr. Silas Snider, of Yonge Street, had a large collection of apples and pears. In the centre of this table there were some pretty bouquets by Mr. Fleming, and a collection of annuals in bloom from Judge Campbell of Niagara. Captain Dick had a very fine dish of pears, Flemish Beauty; and Mr. Bamhart of Streetsville, exhibited 40 varieties of apples and 20 varieties of pears. The opposite side of the hall was nearly all devoted to foreign fruits and flowers. There were fine verbenas from Professor Croft, and two collections of dahlias, from Mr. Barnet of Niagara Falls, and Mr. Fleming. From the Mount Hope Nurseries, Rochester, 40 varieties of verbenas, 32 varieties of Roses and bouquets of flowers, 26 varieties of pears, 22 varieties of apples, and a large specimen of onions and tomatoes; from Ryan's Plank Road Nurseries, Rochester, 75 varieties of dahlias, 31 varieties of apples, 21 varieties of pears and 6 specimens of quince, from Donnellan's Nursery, Rochester, 16 varieties of pears, 37 varieties of apples; large specimens of musk and water-melons, and a fine display of dahlias, verbenas, and china asters.

In the Horticultural tent there were some specimens of the tobacco plant from St. Catharines, some large plants of the Palma Christi or Castor Oil plant, and an excellent assortment of Cabbages and pot herbs from various Toronto gardeners. At the end of the centre table were four Cauliflowers from Wade & Jeckell, Port Hope, of a very large size and finely formed. Some specimens of the Martynia, from Mr. Fleming and Prof. Croft. There was a large display of Onions, some very extraordinary specimens from Baron de Longueuil of Kingston. Mr. Leonard Pears, of Yorkville, had some very fine Chicory in the root, and several specimens of manufactured Chicory from roots raised by him this season. The Baron Longueuil displayed also some large purple egg plants and table carrots. There were fine beets from

the garden at Elmsley House. Two large floral ornaments, one from Mr. Fleming, and the other, a most elaborately constructed one, from Mr. Leslie. Several extraordinary sunflowers, one about 10 feet high, with a head about 18 inches in diameter. Two tubs of annuals from Mr. Maynard, Upper Canada College, very neatly arranged; two immense pumpkins and a large variety of squashes from Mr. Gordon of Yonge Street; a large specimen of garden seeds from Mr. Fleming, a basket of vegetables from Mr. Maynard, and a small Jerusalem cherry plant; a fine assortment of apples from Mr. Granger of Yonge Street; some pretty bottled gooseberries from Enoch Turner; a large assortment of extraordinary sized Tomatoes from various Toronto Gardeners; twenty varieties of apples and pumpkins from Capt. Shaw, and some specimens of musk melon. The display of fruit and flowers and vegetables exhibited in a marked manner the extraordinary adaptation of the climate of this country to all the purposes of Horticulture.

Fine Arts, Ladies' Department.

The law of association by which Worsted and Water Colours, Kane and Crotchet, came to be so nearly connected in the programme of the Exhibition, is not entirely obvious to us. That excellent Judges of *Patchwork* may be found at a certain great Provincial Institution, we are far from denying; but we are ignorant if any School of the Fine Arts includes Wax Flowers and Tapestry, Papier Mache and Fancy Netting, in its course of instruction. Happily for ourselves, while invoking all the female Saints in the calendar for guidance through the array of elegant industries included under class R, one of them—not yet in the calendar—graciously dictated the following remarks, and we commend them cordially to the attention of the fair contributors to this department.

The species of work which, upon the whole, perhaps, was best represented, was *Crotchet;* there were fifteen competitors, and thirty-one entries in this class. The first prize, gained by Miss Galbraith of Toronto, was awarded to a specimen which, besides its delicacy of execution, exhibited much original and elegant fancy. *Tatting*, the amusement of the *Delias* and *Meliissas* of a former day, and lately revived at the Irish Industrial Schools, and elsewhere, was not represented by a single specimen; as it makes a very *pretty* and *everlasting* trimming, as it can be varied and patterned for anything; it may be hoped that it will become better known, and brought into general practice. We were sorry not to see more competitors in the very elegant art of Silk Embroidery, now so *fashionable ;* but one specimen was exhibited;* the exquisite and costly embroidery or lace work on muslin, of which so much is now produced in England, Ireland, and Scotland, often in cabins whose exterior makes its elegance doubly admirable, was not represented at all.

Worsted Work—there was a very extensive and beautiful display of Ladies' Worsted Embroidery in various shapes; the perfection of some of the *work*, when closely examined, could scarcely be surpassed; but we have one hint to give for the future. It will be found that the *richness* and general *effect* of this sort of work will be greatly increased by mingling *Chenille* more profusely with it. For instance, introduce it in flowers, and foliage, in draperies of figures as trimmings, robings for furs, and such like; it will be found in all these to have a most beautiful effect.

Cotton and Worsted Netting was very well displayed, but might have been much varied and improved by the use of different sized *meshes* and greater variety in the *colours* of materials.

Knitted Work was not exhibited in any great variety, nor was the display in general of marked *merit.* It would appear that this art, so dear to the Penates, the innocent resource of so many a solitary fire-side, has been somewhat neglected for more showy, but less useful and *social* occupations. Ladies by exercising their fancy and ingenuity may make *anything* with their knitting-needles,—there is no end to the improvements this art can receive; for instance, knitted quilts would be in every way superior to the patch-work articles on which so much time is wasted. It is to be regretted that *any prizes* are given to these latter laborious, but tasteless productions. A large number of them was, however, as usual, exhibited.

A very beautiful specimen of Raised Worsted Work, by Mrs. Haas, attracted much attention, and gained the first prize; nor must we omit to mention that a carpet, twenty feet square, in Worsted Work, by the Ladies of Hamilton, was an object of great admiration. Unfortunately its size rendered it impossible to place this beautiful specimen of their skill in its proper association with similar objects; it was exhibited under the tent devoted to harness and machinery. The wax figures exhibited were not of Canadian work, but there was a good display of wax fruit and flowers; one group of which, by Miss Willson of Toronto, deservedly gained a prize in both classes. The first prize for flowers was, however, awarded to Miss Cleuch of Cobourg. Hats and Bonnets of Canadian straw were indifferently represented, there being only three competitors; but this number exceeds by two that of the competitors for the prizes so invidiously awarded for gentlemen's shirts! only *one* lady condescended to notice it. Among the unenumerated articles we observed with much pleasure some very beautiful examples of work in hair, by Mrs. J. Cameron of Toronto, and Miss McDonell of Edwardsburg. The exquisite elegance and variety of which this work is susceptible recommend it strongly for more general adoption. Painting on velvet, and painting in imitation of papier mache, found each a representative, and we doubt not as these showy and beautiful arts become more generally known, we shall see as high a degree of excellence attained in them as in those which are more familiar. To this class should also be referred the very pretty D'Oyley's, with designs in the centre etched on *Jean* with marking ink: an elegant way of furnishing an additional attraction to the dinner table; they were contributed to the Fine Arts department by a gentleman.

Of the department of Fine Arts it may be said, that the distressing mediocrity of a large proportion of the contributions, evincing that unconsciousness of what is real excellence, which must prevail in a country where there are no Galleries of Art or Schools of Design, was fully redeemed by the merit of other portions. Foremost, as usual, was Paul Kane, who contributed eight beautiful paintings of Indian subjects; our warm admiration for the talents of this truly excellent and self-taught artist, leads us to express the hope that he will overcome a certain sameness of treatment, and fondness for browns and yellows, which threatens to give a monotony to his otherwise most spirited and faithful pencil.

The prizes for historical paintings were not awarded: the subjects entered by Mr. Kane, which consisted of illustrations of cotemporary Indian life and manners, were not considered by the judges to come properly under that designation. As it was clearly a misapprehension of the nature of the subject required, not a want of power, which occasioned this disappointment, we shall hope to

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* The antiquity of this Art is well-known, but it is not often that its admirers have an opportunity of inspecting an example of ancient work so fine as one which is in the possession of Mrs. Scott Burn, of Toronto, a robe which was embroidered for, and worn by the Empress Maria Theresa of Austria. It would probably be difficult to match this specimen of Needle-work in North America.

see, upon a future occasion, that the spirit stirring incidents of the last war, or the great events which have marked the social progress and constitutional history of the country, have found their fitting expositor in the first native artist of Canada. Considering however, that historical painting is the highest branch of the art, we must remark that the prizes offered are wholly insufficient to tempt an artist capable of executing such a subject to sacrifice time which might be given to easier and more remunerative employment. It must be long before anything but portraits will be in demand in this country: the prizes should be offered for the best sketch or study for an historical painting, not for the painting only. Portrait painting was abundantly but very indifferently represented. It by no means follows that a young artist who can catch a tolerable likeness, and has overcome the first difficulties of the brush, can deal with a full sized portrait. Forgetfulness of this fact, produced some sad examples of vaulting ambition which o'erleaps itself. The portraits were generally too large, and their defects more glaring than their merits, which might not have been the case had they been of half size. A pleasing likeness of a lady by Mr. Geo. Reid, and a portrait in full profile by Mr. Griffith, of much expression, although the colouring and especially the back ground, were far from pleasing, were, with the two Indian portraits, which gained the first and second prize, the only exceptions we remarked. These latter had all the quiet truth and the mellow tone which most of Mr. Kane's portraits possess. Among the landscapes, one by Mr. Whale of Burford, attracted much notice. Whether such trees ever grew in Canada may be a question, but of the merits of the painting there could be none, and the artist who produced it may aspire, with study, to a very high rank in his profession. Mr. William Hind exhibited two oil paintings which showed considerable talent and gave fair promise of future excellence in the higher departments of Art. There was also a view of Burlington Bay, with a boat and a few figures in the foreground, by Mr. Bartram, of much merit for its simplicity and truth to nature. Among the most spirited and striking works exhibited was a coloured crayon of a ship on her beam ends after a storm, by Mr. Wm. Armstrong. The freedom and seaman-like fidelity with which the disorder of the wreck was treated, the admirable effect of the wild heaving waves, and a delicacy of handling it is difficult to describe, gave this drawing an artistic character we should have been glad to recognise in more of the subjects present. The same gentleman obtained the first prize in water colors. There was also a crayon drawing, we believe by Mr. Reid (we would suggest that the names of the artists in all cases be attached) which it is a pleasure to notice, a landscape with a group of trees in the foreground, the foliage remarkably well handled, the lights and shades on the stems and branches extremely good, the sea in the distance and a little church in the middle ground, very well done. Of the twenty three young ladies who exhibited in the amateur list, few we grieve to say, came up to the indulgent standard adopted by the judges in their behalf. The greater part of the drawings exhibited in these classes were indifferent enough. In several of them no prize was awarded, in others only the second prize. That this apparent rigour is absolutely necessary, few who examined the exhibition would deny, and if it leads the exhibitors to form for themselves a much higher standard of excellence, they will not regret hereafter, their disappointment, but it must be admitted to be a difficult question to define the degree of proficiency which the competitors in these classes should display. Some difference there will probably be always in the standard adopted in different years, and efforts be held unworthy of distinction in one place which have obtained it at another. Miss Ida Jones of Bockville, Mrs. J. B. Campbell of Toronto, and Miss Fitzgerald, were the lady amateurs who gained first prizes. Mr. R. J. Griffith was the gainer of several in this class, and before quitting the list we must not fail to commend the pleasing portraits in water colors by Mr. Hoppner Meyer (professional) to which the first and second prizes of that class were awarded. The unsuccessful entries may be referred to as affording a sort of criterion of the extent to which painting or drawing, whether regarded as an accomplishment or a profession, is cultivated in Canada. It appears that there were thirty-eight competitors in the two lists, professional and amateur, and about 143 entries, 73 in the former class, all furnished by Toronto, Hamilton and Burford; 70 in the latter class, to which Brockville, Picton, Cobourg, Niagara, Queenston, Oakville and Wellington Square contributed. The dissemination of an interest in the subject evinced by this list, is the best part of the case, and we believe that it only needs the formation of a School of Design, to elicit works of art as creditable to Canadian ability as were the more practical departments of the Fair. Lithography was represented by two very indifferent portraits and some maps and plans. Mr. Fleming's plan of Toronto, executed at Mr. Scobie's establishment, was by far the best specimen of the art and obtained the first prize. Woodcutting and engraving on copper and steel, were also very inadequately represented, and if the artists in these departments desire to secure to themselves the growing demand for works of the kind in Canada, a little more exertion is desirable. Most of the wood cuts have been repeatedly exhibited before—the new ones being chiefly the maps and illustrations of Smith's Canada, exhibited by Mr. McLear, are well known, and scarcely do justice to the state of the art in Toronto, however fairly they represent the existing demand. Mr. David Fleming exhibited two figures in wood carving, both spirited, and also a number of bread trenchers executed in Canadian wood, of the designs which the *Art Journal* has made so familiar. These very favorite novelties open a wide field for the wood carver, and it may be hoped will be followed by other things of the kind. If they also recommend *wood-carving* as an art particularly adapted to the amateur, and lead to its extension to articles of household furniture and ornament, few who have witnessed the massive carved chairs, chests and tables, of old English farm-houses one the one hand, or the delicate and spirited wood carvings of the Swiss and German peasants on the other, will think it a bad result.

We must conclude this long notice, which is nevertheless incomplete, by suggesting to those artists who are not in the habit of exhibiting on these occasions, that although a shed at an Agricultural Show can never be made a Gallery of Art, it will long be the best opportunity the bulk of the population have for acquiring correct ideas upon the subject; a consideration beyond the value of the prizes should therefore induce them to contribute something upon each occasion to raise the standard of taste, and elicit among the thousands before whom they are displayed, that power and enthusiasm which is only dormant, not dead. The quality of the exhibition in this department must be greatly raised, before a stranger can be referred to it as a criterion of the progress the Fine Arts have made in this country.

Educational Department.

At the east end of the Fine Arts Department a building was specially erected and appropriated for the reception of a variety of educational requisites and school furniture, contributed by the Rev. Dr. Ryerson, Chief Superintendent of Schools for Upper Canada.

The collection was very extensive and varied, including many interesting articles, never before introduced into the Canadian Schools, designed to assist in promoting the instruction of youth by an appeal as well to their senses as to their intellect. The samples exhibited were selected from the depository connected with the Department of Public Instruction for Upper Canada. They are for sale by the department to public schools throughout

the province. The articles exhibited may be classified as follows:

1. School Furniture,
2. Maps and Atlases,
3. Charts and Diagrams,
4. Prints and Miscellaneous Illustrations,
5. Apparatus, &c.,
6. School Books and Publications.

1. The *School Furniture* consisted of master's desks, desks and seats for students, and for large and small pupils. The general appearance of the desks may be gathered from the accompanying figure, except that in the engraving the writing desk is omitted and the third or lowest drawer occupies the place of the feet of the desk.

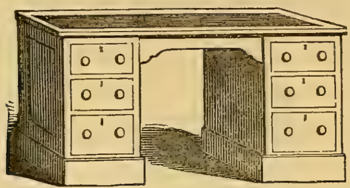


Fig. 1.

The other articles of furniture comprised a double desk for two students with appropriate chair seats (see figure 2.) and a variety

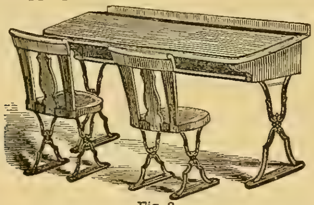


Fig. 2.

of single desks with similar chairs. Each desk is furnished with a shelf underneath the upper part of the desk, as seen in the engraving. (Fig. 2.) Both desks and seats are attached to iron supports which are designed to be fastened by screws to the floor. The height of the desks and seats are graduated, so as to answer for pupils of all ages. (See figures 2 and 3.) For the younger children a single chair-like seat is provided with a small open work iron basket attached to its side, designed to contain the pupil's books, &c.

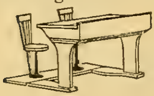


Fig. 3.

Furniture after the patterns exhibited, is manufactured in oak, by Messrs. Jaques & Hay, Toronto, at prices varying from 20 to 30 per cent. cheaper than the same articles could be procured in Boston, where the samples were obtained.

2. The specimens of *Maps* exhibited included samples of the Irish National Series, Johnston's, Varty's, the Christian Knowledge Society, Chambers' and other publishers in Britain and the United States. Each series is characterized by some peculiarity and excellence. The National Maps present a bold outline and are highly coloured; Johnston's are accurately drawn and beautifully coloured and varnished; the Chris. Kno. Soc. maps are very full—the land and water are coloured and varnished. Chambers' are clear and bold. In these maps the initial letter of the names of places is very large and the remainder of the word small. This is designed to avoid confusion arising from the multiplicity of names usually crowded on a map. Varty's are similar to the National Maps (both being constructed by Arrowsmith) only they are engraved on a much smaller scale—probably one-half the size. The "combination" maps of this series (i.e., the full and outline maps mounted on the same canvass and rollers) present many excellencies, and afford greater facility for testing the knowledge of the student than any of the others. Each series contains maps of ancient, modern and scripture geography. We understand that the maps are sold at the depository, mounted, ready for use, at about currency for sterling, or about 30 per cent. less than they could be otherwise obtained, owing to the very satisfactory arrangements made by the Chief Superintendent of Schools with the English and American publishers.

The *Atlases* of the depository exhibited, included those published by Johnston, Chambers, Reid, Whyte, &c., &c., and comprise the elementary of the more advanced and the highest class of publications under this head. The prices noted on the atlases varied from £1 10s. up to £2 12s. 6d.—the cost of Johnston's celebrated Physical Atlas, (quarto edition.)

3. The series of *Charts and Diagrams* included historical charts and various illustrations in natural philosophy and astronomy. Johnston's Illustration of Natural Philosophy, Youman's Chart of Chemistry, and Varty's Astronomical Diagrams, attracted general attention from their distinctness and vivid colours.

4. *Prints and miscellaneous Illustrations.*—The selection from the specimens in the depository under this head was the fullest and most striking of the articles exhibited. It included illustrations of natural history, (200 specimens,) scripture history, scripture sites, scripture scenes, geography, grammar, spelling, reading, astronomy, geometry, writing, music, drawing, &c , &c. In teaching these branches the aid of the senses is called into requisition, and almost all the sheets contained engravings or drawings of some description accompanied by letter press description, printed in large type so as to be seen at a distance. There were also a great variety of tablet lessons, rules for schools, the ten commandments, &c., printed on large sheets for hanging up in the schools.

5. *School Apparatus*—Under this head was exhibited Holbrook's School Apparatus, comprising an orrery, tellurian, lunarian, geometrical forms and solids, and other useful adjuncts to a school. Also, the "Natural History of the Silk Worm" in a neat glass case, containing the worm, the moth, the eggs, and the cocoon, under two aspects. It is a beautiful little musenm in itself.

6. *School Books and Publications.*—Among the books exhibited were the Dublin edition of the National series, various elementary works on agriculture and chemistry, natural history, &c., &c. Among the publications issued by the depository we observed an admirable little work on "Physical Training in Schools" in a series of gymnastical exercises (without the use of apparatus,) containing upwards of one hundred engravings of the different positions of the gymnast; price 7½d. Also the ten commandments, the Lord's prayer, and some admirable rules for schools, in sheets, 7½d. for the three;—school teachers' registers, &c., &c.

Altogether the display of school requisites was very interesting and attracted general attention. The collection was referred to by the President of the Association and other gentlemen, as among the most valuable contributions to the exhibition in its relation to the schools, and to the country.

Horses.

We were surprised to notice the large number of horses that were brought together on this occasion. Every Canadian pre-

sent must have felt proud to see such a collection of splendid animals. The dashing carriage or coaching horse and the ponderous cart horse, were both represented there. We understand that there were ninety stallions of all descriptions exhibited, a number not often equalled at any of the shows in Britain.

The show of thorough-bred horses was rather small, but there were several specimens on the ground. Those that more particularly attracted our notice were "Valparaiso," and a young horse owned by Walter Dickson, Esq., of Niagara.

The very liberal and public spirited premium offered by the President of the Association, T. Street, Esq., for that stamp of horse which would come up to our ideas of a good coaching horse, occasioned much competition. This prize was won by the horse "King George," (who also won the prize for the best agricultural horse,)—a Cleveland bay,—a breed of horses reared to a great extent in Yorkshire. In activity and hardiness these horses have no superior. Although we agree with the Judges in their decision as to this horse coming nearest to our notion of a coaching horse, yet we must be permitted to remark that we considered him deficient in the thigh, which appeared to account for the rather awkward action of his hind legs.

We would with all deference to our agricultural readers, suggest to them the trial of breeding this description of horse, which from lengthened experience of Canada, we can confidently advise; this stamp of Horse having abundance of power for all the purposes of the farm.

We must confess that we were rather disappointed at not seeing a larger number of well-matched carriage horses exhibited, for although there were several very good pairs present, yet in a city like Toronto, a much greater number might have been expected. Among the young horses exhibited there were many promising animals, which we have no doubt will bring high prices to their owners, when broken in and fit for use. Among the heavy draught horses there were several good animals. We understand that the pair which received the first prize were sold for £100, which may be considered a substantial return for the trouble and expense of rearing them.

Before closing our remarks on this description of stock, we have much gratification in recording the fact that our "go-a-head" and shrewd brother "Jonathan" places a high value on the horse produced in Canada, which is substantially proven by the large sums of money annually left by our neighbours, who also overrun Western Canada in the purchase of all other descriptions of stock.

Before we proceed to give the names of the successful competitors we must award our meed of praise to the exertions of the Executive Committee for their arrangements in relation to the display of horses—the ground being of the most ample description:—

HORSES COMPETING FOR THE PRESIDENT'S PRIZE OF £30.

JUDGES.—A. Alcorn, David Jones, John Barwick, J. P. Hough, John Kerr.

Thomas Blanchard, Toronto Township, £30.

Best Stallion for Agricultural purposes.

1, Thomas Blanchard, Toronto, £7 10s; 2, Joseph Ashford, Drummondville, £5; 3, Robert Robson, London, £2 10s.

Best Heavy Draught Stallion.

Mrs. Ward, Markham, £7 10s; 2, J. & W. Crawford, Scarboro', £5; 3, John Wilson, Whitby, £2 10s.

Best 3 year old Stallion.

1, William Waddel, Pickering, £5; 2, Isaac Modland, Chinguacousy £3; 3, Robert Brown, Cobourg, £1.

Best 2 year old Stallion

1, S. Shunk, Vaughan, £3; 2, Peter Mussleman, Vaughan, £2; 3, William Chirry, Markham, £1.

Best 3 year old Filly.

1, Jesse Trull, Darlington, £2 10s; 3, William Cox, Darlington, £2 10s; 3, William McMicking, Stamford, £1.

Best 2 year old Filly.

1, T. Lumsden, Whitby, £3; 2, Richard Ibson, Toronto Township, £2; 3, William Fitzpatrick, York, £1.

Best Span Matched Carriage Horses.

1, W. H. Dickson, Niagara, £4; 2, John J. Petit, Saltfleet, £3; 3. Hon. William Allan, Toronto, £1.

Best Span Draught Horses.

1, William Armstrong, Markham, £4; 2, William Miller, Pickering, £3; 3, Simon Shunk, Vaughan, £1.

Brood Mare and Foal.

1, J. Brown, Etobicoke, £5; 2, Thomas Armstrong, Vaughan, £3; 3, William Trull, Darlington, £1.

Best Saddle Horse.

1, E. C. Jones, Toronto, £2; 2, J. Grantham, Toronto, £1 10s; 3, William Lafontaine, Toronto, £1.

CLASS G.—BLOOD HORSES.

JUDGES.—Geo. Robson, Peter Davy, John Harland, O. Blake, Walter McKenzie.

Thorough-bred Stallion.

1, H, Huntingford, £7 10s; 2, George Cooper, York, £5; 3, W. H Dickson, Niagara, £2 10s.

Thorough-bred 3 year old Stallion.

1, George S. Ross, Toronto, £5; 2. James White, Trafalgar, £3; 3, William Shane, Toronto Township, £1.

Thorough-bred 3 year old Filly.

1, Joseph Holly, Weston, £4; 2, George Cooper, York, £2 10s.

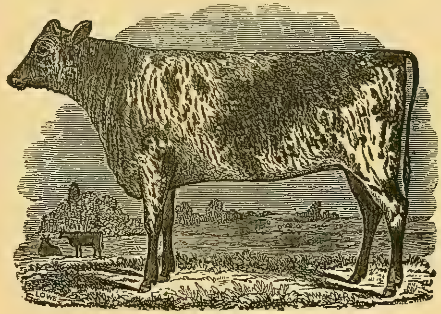
Thorough-bred 2 year old Filly.

1, Judge McLean, Toronto, £3.

Thorough-bred Mare and Foal.

1, James White, Trafalgar, £5.

The Judges appointed to examine the aforementioned description of Horses, regret to say that the exhibition in this class is very limited; they hope, however, next year the few superior animals that have been exhibited will produce an improved and more numerous Stock.



Prize Calf.

As it would be outstepping the legitimate limits of the *Canadian Journal*, to notice at length the Farming Stock exhibited at the Show, we shall confine our remarks to one or two remarkable illustrations of the progress which has been made in Canada, in this most important department of Agricultural industry. Among the most conspicuous on the ground we noticed the herd of Mr. Ralph Wade, jun., Cobourg. One of his calves, a heifer six months old, a portrait of which we attach to this notice, realized the sum of $300, having been bought by Mr. Becar of New

York. Another of his cattle, a bull, three years old, was sold to J. Wood, Esq., Jefferson County, New York, for the same amount.

Along with the general symetry of these animals, we could not but be struck with their velvety softness of hair and delicacy of touch. Mr. Wade informed us also, that on the side of both sire and dam they are descended from a race of most excellent milkers. They were bred from a cow imported by Mr. Ralph Wade, jun., the foundation we believe of his present stock. Their sire "American Belted Will," lately sold to Mr. Duguill, of Genesee County, was bred from an imported cow, by Mr. R. Wade, sen., and took the first prizes at the Provincial Shows, both at Brockville and Kingston. The sire of "American Belted Will" took the second premium at the British agricultural meeting at Newcastle, where twenty-four were shown; Mr. Hopper's celebrated bull, Belleville, carrying off the first prize.

We rejoice to see our Canadian farmers raising herds of such purity and of so independent a character, as while it affords us an opportunity of making use of any really valuable strain arising among the cattle of our American neighbors, cannot fail to draw them into our market as the most desirable in which to seek those infusions of new blood so necessary to maintain in full vigor any race of cattle.

Poultry.

The shew of Poultry at the Exhibition was very good, although from the prizes being offered only for the large breeds, it was not so varied as might have been wished. The kinds of fowls shown were the "Shanghae," the "royal Shanghae," (two distinct varieties,) the "black Java," "Cochin China," and a large kind of fowl called the "Queen's breed." These were the largest. Next in size were the "black Spanish," then the "Dorking" and "Poland," all extremely fine of their various kinds, but more conspicuous for size than symmetry of figure; indeed, the whole of the first named sorts from the eastern coasts of China and its neighborhood, seem to have been bred for the sake of size alone, weight having entirely counterbalanced beauty of plumage and figure. As a pure breed, it is doubtful whether any of the eastern breeds will prove profitable to the farmer, but as crosses with our various domestic kinds all will doubtless prove highly advantageous. The pure breeds are too scanty of feathers to enable them to brave our Canadian winters unprotected, but their judicious admixture with the common barn-door fowl will raise the standard of poultry. The chief exhibitors were Messrs. Goodenough and Horne. The Hon. W. Allan exhibited some white Shanghae and Dorking fowls of superior quality. Amongst these various giant breeds were exhibited two cages of diminutive bantoms, which excited considerable attention from the contrast in size and figure. The latter, although good layers, can only be considered as pets and curiosities. A pair of enormous geese of the black-billed variety, some excellent turkeys, and a great variety of pretty pigeons, some of the English variety of wild rabbit, bred in Canada, and some muscovy and common ducks completed the collection. There is little doubt that the introduction of the improved breeds will raise the standard of Canadian poultry far above its present grade.

Analysis of the Exhibition.

STATEMENT relative to the late Provincial Exhibition, showing the amount of competition brought out by the liberal prizes offered, the number of entries made, the number and class of prizes awarded, and the amount of the same, under each heading, the total in each class, and the whole total in all the classes. The Judges have not in all cases adhered strictly to the number of premiums laid down in the published prize list, but have in a few discretionary instances changed them slightly, making them fewer or more as the case may be. For the exact amount offered in each class of prizes under each heading, refer to the printed list published before the Fair.

The figures, 1, 2, 3, &c., in the column just to the left of the column of Pounds, denote the number and class of prizes awarded under each heading, whether first, second, third, &c., as the case may be, or all of them. Where no entries have been made it does not arise in all cases from the absence of the articles in the country, but rather from the accidental circumstance of the owners or producers not happening to offer them for competition, either through indifference or inattention. Where entries have been made, and no prize awarded, it has arisen, in some cases, from the want of merit in the articles, or in others from some objection on account of non-compliance with some rule of the Association, or in other cases, possibly, from oversight or being too late upon the ground, &c. The Diplomas awarded are not mentioned here, being given along with the names of the parties in the published list of prizes. In estimating the whole number of animals or articles entered, it is necessary to observe that, a number of the entries, as in sheep, poultry, and various manufactures, are each for two or several specimens of the article exhibited.

ARTICLES.	No. of Entries.	Prizes Awarded.	Amount. £	s.	d.
CLASS A.					
Durham Bull	5	1,2,3,4.	14	0	0
Do. do. 3 year old	5	1,2,3,4.	12	0	0
Do. do. 2 year old	12	1,2,3,4.	10	5	0
Do. do. 1 year old	5	1,2,3,4.	7	15	0
Do. do. Calf of 1852	8	1,2,3,4.	5	15	0
Do. Cow	19	1,2,3,4.	11	0	0
Do. do. 3 year old	7	1 & 2.	6	10	0
Do. Heifer 2 year old	9	1,2,3,4.	6	15	0
Do. do. 1 year old	5	1,2,3.	5	0	0
Do. do. Calf of 1852	6	1,2,3,4.	3	5	0
Total, Durhams	81	No. 37.	82	5	0
CLASS B.					
Devon Bull	4	1,2,3.	13	0	0
Do. 2 year old	1	1.	4	10	0
Do. 1 year old	1	1.	3	10	0
Do. Calf of 1852	4	1,2,3.	5	5	0
Cow	7	1,2,3.	8	0	0
Heifer, 2 year old	5	1,2,3.	6	0	0
Do. 1 year old	4	1,2,3.	5	0	0
Do. Calf of 1852	4	1,2,3.	3	0	0
Total Devons	30	No. 20	48	5	0
CLASS C.					
Hereford Bull	1	1.	6	10	0
Do. 1 year old	2	1,2.	5	15	0
Cow	2	1,2.	8	0	0
Total Herefords	5	5	20	5	0
CLASS D.					
Ayrshire Bull	4	1,2,3.	13	0	0
Do. 2 year old	2	1.	4	10	0
Do. 1 year old	3	1,2.	5	15	0
Do. Calf of 1852	3	1,2,3.	5	5	0
Cow	4	1,2,3.	10	0	0
Heifer, 2 year old	2	1,2.	5	0	0
Do. 1 year old	2	1,2.	4	0	0
Do. Calf of 1852	1	1.	1	10	0
Total Ayrshires	21	17	49	0	0
CLASS E, 1.					
Grade Cow	11	1,2,3.	8	0	0
Do. 3 year old	5	1,2,3.	6	15	0
Heifer, 2 year old	3	1,2.	5	0	0
Do. 1 year old	7	1,2,3.	5	0	0
Do. Calf of 1852	7	1,2,3.	2	15	0
Total Grades	33	14	27	10	0
CLASS E, 2.					
Fat Ox or Steer	7	1,2,3.	6	0	0
Cow or Heifer	7	1,2,3.	6	0	0
Yoke of Working Oxen	5	1,2,3.	6	0	0
Ox or Steer for Butcher's Prize	2	1,2.	15	0	0
Total Fat Cattle and Oxen	21	11	33	0	0

ARTICLES.	No. Ent's.	Prizes Awd'd.	Am'nt.
CLASS F.			
Stallion for President's Prize	37	1	30 0 0
Do. for Agricultural purposes	34	1,2,3.	15 0 0
Do. Heavy Draught	15	1,2,3.	15 0 0
Do. 3 year old	19	1,2,3.	9 0 0
Do. 2 year old	17	1,2,3.	6 0 0
Filly, 3 year old	12	1,2,3.	7 10 0
Do. 2 year old	15	1,2,3.	6 0 0
Span matched Carriage Horses	20	1,2,3.	8 0 0
Do. Draught Horses	8	1,2,3.	8 0 0
Brood Mare and Foal	17	1,2,3.	9 0 0
Saddle Horse	18	1,2,3.	4 10 0
Total Horses,	212	31	118 0 0
CLASS G.			
Thorough-bred Stallion	5	1,2,3.	15 0 0
Do. do. 3 years old	6	1,2,3.	9 0 0
Thorough-bred 3 year old Filly	3	1,2.	6 10 0
Do. do. 2 year old Do.	1	1.	3 0 0
Thorough-bred Mare and Foal	1	1.	5 0 0
Total Blood Horses	16	10	38 0 0
CLASS H.			
Leicester Ram two Shears or over	11	1,2,3.	7 0 0
Do. do. Shearling	9	1,2,4.	4 15 0
Do. do. Lamb	29	1,2,3.	3 10 0
Do. 2 ewes 2 shear and over	8	1,2,3.	8 10 0
Do. 2 ewes Shearling	7	1,2,3.	6 0 0
Do. 2 Ewe Lambs	15	1,2,3.	3 0 0
Total Leicesters	79	18	32 15 0
South Down Ram, two Shear and over	10	1,2,3.	7 0 0
Do. Shearling	9	1,2,3.	4 5 0
Do. Lamb	5	1,2,3.	4 0 0
Two Ewes two Shear and over	7	1,2,3.	8 10 0
Do. do. Shearling	4	1,2,3.	6 0 0
Do. do. Lanbs	4	1,2,3.	3 0 0
Total South Downs	49	18	32 15 0
Merinos Ram two Shear and over	11	1,2,3.	7 0 0
Do. Shearling	2	1,2.	4 0 0
Do. Lamb	6	1,2,3.	3 10 0
Two Ewes, two Shear and over	6	1,2,3.	8 10 0
Do. do. Shearling	2	1,	3 0 0
Do. Ewe Lambs	6	1,2,3.	3 0 0
Total Merinos and Saxons	33	15	31 0 0
Fat Sheep, Two Wethers	10	1,2,3.	6 0 0
Two Ewes	8	1,2,3.	6 0 0
Total Fat Sheep	18	6	12 0 0
Boar, one year and over	9	1,2,3.	6 0 0
Breeding Sow, one year and over	10	1,2,3.	6 0 0
Boar of 1852	3	1,2.	3 10 0
Sow of 1852	11	1,2,3.	4 10 0
Total Pigs, Large Breed	33	11	20 0 0
CLASS I.			
Boar, one year and over	3	1.	3 0 0
Breeding Sow one year and over	7	1,2,3.	6 0 0
Boar of 1852	1	1.	2 0 0
Sow of 1852	4	1,2,3.	4 10 0
Total Pigs, Small Breed	15	8	15 10 0
Class J.—Poultry.			
Pair Dorking Fowls	6	1,2,	0 15 0
Pair Poland Fowls	7	1,2,	0 15 0
Pair large breed Fowls	16	1,2,3,	0 17 6
Pair Turkeys	5	1,2,	0 15 0
Pair large Geese	10	1,2,	0 15 0
Pair Muscovy Ducks	1	0,0,	0 0 0
Pair Common Ducks	7	1,2,	0 15 0
Pair Guinea Fowls	1	0,0,	0 0 0
Lot of Poultry (for best)	4	1,	0 10 0
Total Poultry	57	14	£5 2 6

L

ARTICLES.	No. Ent's.	Prizes Awd'd.	Am'nt.
Class K.—Agricultural Productions.			
25 bushels Fall Wheat	28	1,2,3,	40 0 0
2 " do.	36	1,2,3,	5 10 0
2 " Spring Wheat	27	1,2,3,	5 10 0
2 " Barley	14	1,2,3,	3 0 0
2 " Rye	6	1,2,3,	3 0 0
2 " Oats	12	1,2,3,	3 0 0
2 " Peas	17	1,2,3,	3 0 0
2 " Marrowfat Peas	19	1,2,3,	3 0 0
2 " Indian Corn (in the ear)	8	1,2,3,	3 0 0
1 " Timothy Seed	10	1,2,3,	3 0 0
1 " Clover Seed	5	1,2,3,	3 0 0
1 " Hemp Seed	3	1,2,3,	2 5 0
1 " Flax Seed	10	1,2,3,	3 0 0
20 lbs. Swede Turnip Seed	3	1,2,	1 5 0
Bale of Hops	12	1,2,3,	5 0 0
1 bushel Potatoes	48	1,2,3,	1 10 0
1 " Swede Turnips	11	1,2,3,	1 10 0
1 " White Globe Turnips	2	1,2,	1 5 0
1 " Aberdeen Yellow Turnips	1	1,	0 15 0
1 " Red Carrots	4	1,2,3,	1 10 0
1 " White or Belgian Carrots	8	1,2,3,	1 10 0
1 " Long Red Mangel Wurzel	11	1,2,3,	1 10 0
1 " Yellow Globe Mangel Wurzel	8	1,2,3,	1 10 0
12 roots Khol Rabi	6	1,2,	0 15 0
1 bushel Sugar Beet	5	1,2,3,	1 10 0
1 " Parsnips	3	1,2,3,	1 10 0
4 Cattle Squash	6	1,2,3,	1 10 0
Manufactured Tobacco	2	1,	1 0 0
28 lbs. Broom Corn Brush	6	1,2,3,	2 5 0
112 " Flax	3	1,2,3,	11 0 0
112 " Hemp	2	1,2,	6 10 0
Total Agricultural Productions	336	85	£123 10 0

ARTICLES.	No. Ent's.	Prizes Awd'd.	Am'nt.
Class L.—Horticultural Products.			
20 varieties Apples, named	18	1,2,3,	1 10 0
12 Table Apples, named	53	1,2,3,	1 2 6
12 Winter Apples, named	56	1,2,6,	1 2 6
Variety of Pears, n'd (for best & greatest)	5	1,2,3,	1 10 0
12 Table Pears, named	23	1,2,3,	1 2 6
12 Winter Pears, named	18	1,2,3,	1 2 6
12 Dessert Plums, named	35	1,2,3,	1 2 6
12 Baking Plums, named	18	1,2,3,	1 2 6
12 Hot-house Peaches	4	1,2,3,	1 2 6
12 Open Air Peaches	26	1,2,3,	1 2 6
Collection of Open Air Peaches	2	1,2,	0 17 6
4 bunches Hot-house Grapes	5	1,2,3,	1 2 6
4 " Open Air Black Grapes	3	1,2,3,	1 2 6
4 " Open Air White Grapes	11	1,2,3,	1 2 6
2 Pumpkins	10	1,2,3,	1 2 6
4 Table Squashes	10	1,2,3,	1 2 6
12 Tomatoes	18	1,2,3,	1 2 6
4 heads Cauliflower	5	1,2,3,	1 2 6
4 heads Summer Cabbage	3	1,	0 10 0
4 heads Winter Cabbage	14	1,2,3,	1 2 6
12 table Carrots	7	1,2,3,	1 2 6
12 roots White Celery	7	1,2,3,	1 2 6
12 roots Red Celery	6	1,2,3,	1 2 6
Dozen Capsicums	7	1,2,3,	1 2 6
Six Purple Egg Plants	4	1,2,3,	1 2 6
12 Blood Beets	8	1,2,3,	1 2 6
Peck White Onions	8	1,2,3,	1 2 6
Peck Yellow Onions	8	1,2,3,	1 2 6
Peck Red Onions	12	1,2,3,	1 2 6
Half bushel White Table Turnips	3	1,2,3,	1 2 6
Peck White Beans	10	1,2,3,	1 2 6
Dozen Dahlias, named	3	1,2,	0 17 6
Bouquet Cut Flowers	3	1,2,	0 17 6
Collection Green House Plants	3	1,2,3,	2 5 0
Collection Annuals, in bloom	4	1,2,3,	1 2 6
Floral Ornament	3	1,2,	1 15 0
"Canada Coffee," (or Chick Pea)	3	1,2,3,	1 0 0
Water Melon	6	1,2,	0 17 6
Musk Melon	18	1,2,3,	1 2 6
Collection Dahlias	2	1,	1 0 0
Variety Green House Plants	1	0,	0 0 0
Variety Vegetables	4	1,2,3,	1 2 6
2 bunches Grapes, (for best and heaviest)	3	1,2,3,	1 2 6
20 roots Chicory	7	1,2,	0 17 6
20 lbs. Manufactured Chicory	5	1,2,	1 10 0
Total Horticultural Products	482	121	£50 5 0

ARTICLES.	No. Ent's.	Prizes Awd'd.	Am'nt.
CLASS M.—AGRICULTURAL IMPLEMENTS.			
Wooden Plough	20	1,2,3,	4 10 0
Iron Plough	9	1,2,3,	4 10 0
Pair of Harrows	5	1,2,3,	2 5 0
F nning Mill	3	2,3,	1 10 0
Threshing Machine	4	1,2,3,	10 0 0
Grain Drill	4	1,2,3,	6 0 0
Straw Cutter	9	1,2,3,	2 5 0
Smut Machine	2	1,	1 10 0
Grain Cracker	2	1,2,	3 10 0
Corn and Cob Crusher	2	3,	0 10 0
Clover Machine	1	1,	2 0 0
Two-horse Waggon	12	1,2,3,	6 0 0
Horse Rake	1	1,	1 0 0
Metal Roller	3	1,2,	4 15 0
Reaping Machine	1	1,	5 0 0
Stump Extractor	1	0,	0 0 0
Mowing Machine	1	1,	5 0 0
Cultivator	8	1,2,3,4	3 10 0
Set of Horse Shoes	8	1,2,3,	1 10 0
Half dozen Narrow Axes	7	1,2,3,	1 10 0
Half dozen Manure Forks	5	1,2,3,	1 10 0
Half dozen Hay Forks	5	1,2,3,	1 10 0
Half dozen Scythe Snaiths	5	1,2,3,	1 10 0
Ox Yoke and Bows	3	1,	0 15 0
Grain Cradle	4	1,2,	0 15 9
Half dozen Iron Shovels	1	1,	0 15 0
Total Agricultural Implements	126	56	73 10 0
CLASS N.			
Firkin Butter, 56 lbs. or more	15	1,2,3.	5 0 0
Cheese, 30 lbs. or more	26	1,2,3.	5 0 0
2 Stilton Cheese, 14 lbs. or more	9	1,2,3.	5 0 0
Butter, not less than 20 lbs.	23	1,2,3.	3 0 0
30 lbs. Maple Sugar	4	1,2,3.	1 15 0
Sugar made by Indians	1	2.	0 10 0
Starch	3	1,2.	1 5 0
Collection Soaps	1	1.	0 15 0
Total, Dairy Products, &c.	82	19	22 5 0
CLASS O.			
Side Saddle	3	1,2.	1 15 0
Whips and Whip Thongs	1	1.	1 10 0
Set of Farm Harness	5	1,2,3.	3 0 0
Set of Pleasure Harness	7	1,2,3.	3 0 0
Saddle and Bridle	3	1,2.	1 15 0
Travelling Trunk	2	1,2.	2 0 0
Side of Sole Leather	15	1,2,3.	2 10 0
Side of Upper Leather	11	1,2,3.	1 10 0
Skirting Leather	11	1,2,3,4,5.	2 10 0
Calf Skin	18	1,2,3,4.	2 0 0
Side of Harness Leather	14	1,2,3.	1 10 0
Fur Hat	4	1,2,3.	1 10 0
Fur Cap	11	1,2,3.	1 10 0
Fur Sleigh Robe	6	1,2,3.	1 10 0
Bootmaker's work	4	1,2,3.	1 10 0
Total Leather and Furs	115	43	29 0 0
CLASS O, 2.			
Specimen Silversmith's work	1	1.	2 0 0
Ornamental Iron work (cast)	1	1.	1 10 0
Coppersmith's work	1	1.	1 0 0
Iron Tinproof Vault Door	5	1,2.	2 15 0
Cooking Stove and Furniture	13	1,2,3.	3 0 0
Parlour Stove	10	1,2,3.	1 15 0
System of Ventilating Buildings	3	1,2.	3 0 0
Balance Scales	2	2,3.	1 0 0
Model Hot air Apparatus	1	1.	1 10 0
Steaming Apparatus for feeding Stock	2	1.	1 10 0
Set of Cooper's Tools	2	1,2.	1 5 0
Set of Bench Planes	1	1.	15 0
Pair of Hames	3	1,2.	15 0
Blacksmith's Bellows	5	1,2.	2 0 0
Rifle	3	1,2.	1 5 0
Total manufactures in Metal	53	26	25 0 0
CLASS P.			
Specimen Sawed Pine	1	1.	10 0
Specimen Sawed Oak	2	1.	10 0
Do. Graining Wood	3	1,2,3.	3 0 0
Centre Table	2	1,2.	1 15 0
Sofa	1	1.	3 0 0
CLASS P—*Continued.*			
One-horse Pleasure Carriage	4	1,2,3.	3 0 0
Two-horse Pleasure Carriage	2	1.	2 0 0
Dozen Broom Handles, (turned)	1	1.	10 0
Dozen Flour Barrels	2	1,2.	1 10 0
Wooden Pail	1	1.	5 0
Wash-tub	1	1.	7 6
Washing Machine	1	1.	10 0
Churn	5	1.	15 0
Four or six Pannelled Door	1	1.	15 0
Model Beehive	2	1,2.	15 0
Total Cabinet Ware, &c.	29	22	19 2 6
CLASS Q.			
Woolen Carpet	1	0.	0 0 0
Woolen Blankets	7	1,2,3.	3 10 0
Counterpanes	10	1,2,3.	2 5 0
Flannel	4	1,2,3.	2 5 0
Satinet	7	1,2,3.	2 5 0
Broad Cloth	3	1.	2 0 0
Home-made Flannel	5	1,2,3.	1 10 0
Fulled Cloth	4	0.	0 0 0
Shawls, home-made	2	1.	15 0
Linen Goods	3	1,2,3.	1 10 0
Flax and Hemp Cordage	10	1,2,3.	1 10 0
Total Woolen and Flax Goods	56	23	17 10 0
CLASS R.			
Crotchet Work	31	1,2,3.	2 5 0
Woolen or Cotton Netting	11	1,2.	1 5 0
Fancy Netting	7	1,2.	1 5 0
Fancy Knitting	18	1,2,3,4.	2 0 0
Embroidery	15	1,2,3,4.	2 15 0
Worsted Work	47	1,2,3,4.	1 17 6
Raised Worsted Work	19	1,2,3.	2 5 0
Wax Fruit	1	1.	15 0
Wax Flowers	11	1,2,3.	1 10 0
Wax Figures	1	0.	0 0 0
Pair Woolen Socks	9	1,2,3.	1 2 6
Pair Woolen Stockings	4	1,2,3.	1 2 6
Quilts	38	1,2,3,4,5.	5 0 0
Gentlemen's Shirts	1	2.	10 0
Pair Woolen Mittens	8	1,2.	1 0 0
Pair Woolen Gloves	1	2.	7 6
Hat, Canadian Straw	6	1,2,3.	1 2 6
Total Ladies Department	229	44	26 2 6
CLASS S.			
Professional List in Oil.			
Historical Painting, Canadian subject	3	0.	0 0 0
Landscape, Canadian subject	9	1,2.	5 0 0
Animals	4	1,2.	4 0 0
Portrait	16	1,2.	4 0 0
Amateur List in Oil.			
Historical Painting, Canadian subject	7	1.	2 10 0
Landscape, Canadian subject	9	2.	1 10 0
Animals, grouped or single	2	2.	1 10 0
Portrait	4	2.	1 0 0
Professional in Water Colous.			
Landscape, Canadian subject	12	2.	1 10 0
Portrait	8	1,2.	3 0 0
Miniature	2	0.	0 0 0
Amateur in Water Colours.			
Portrait	1	2.	1 0 0
Animals	9	2.	1 0 0
Miniature	3	1.	1 10 0
Flowers	5	1,2.	1 15 0
Professional Pencil and Crayon.			
Pencil Potrait	2	2.	0 0 0
Crayon Portrait	2	0.	0 0 0
Pencil Drawing	4	1.	1 10 0
Crayon Drawing	7	1,2.	2 10 0
Coloured Crayon	6	1.	1 10 0
Amateur Pencil and Crayon.			
Pencil Portrait	4	0.	0 0 0
Crayon Portrait	3	0.	0 0 0
Pencil Drawing	11	1,2.	1 15 0
Crayon Drawing	10	1.	1 9 0
General.			
Coloured Geometrical Drawing	3	0.	0 0 0
Collection Daguerreotypes	3	1,2.	2 10 0
Lithography	11	1,2.	2 10 0

ARTICLES. *General—Continued.*	No. Ent's.	Prizes Awd'd.	Am'nt.
Wood Engraving	5	1,2.	2 10 0
Copper Engraving	4	1,2.	2 10 0
Steel Engraving	3	1.	1 10 0
Seal Engraving	2	1.	2 0 0
Carving in Wood	3	1,2,3.	4 0 0
Modelling in Plaster	3	1.	2 0 0
Ornamental Writing	2	2.	0 10 0
Stuffed Birds	4	1,2.	1 10 0
Picture Frame, Gilt	1	2.	0 10 0
Picture Frame, Veneered	3	0.	0 0 0
Stucco Moulding	1	0.	0 0 0
Stained Glass	2	0.	0 0 0
Dentistry	1	0.	0 0 0
Mechanical Production, for Mech. In. Prize	4	0.	0 0 0
Ornamental Penmanship, competing for a gold medal	2	1 Medal.	
Total Fine Arts	201	43	59 10 0
CLASS T.			
Specimens Bookbinding	8	1,2,3.	2 5 0
Ream of Printing Paper	5	1,2,3.	2 5 0
Letter-press Printing	17	1,2,3.	5 0 0
Total Bookbinding, &c.	30	9	9 10 0
CLASS U.			
Pair Moccasins, plain	1	0.	0 0 0
Pair Moccasins, with Porcupine quills	1	1.	0 5 0
Do. do. with Beads	1	0.	0 0 0
Total Indian Prizes	3	1	0 5 0
CLASS V.			
Specimens of Pottery	5	1,2,3.	2 5 0
Do. Draining Tiles	4	1,2,3.	2 5 0
Dozen Bricks	1	1.	0 10 0
Water Filters	2	1.	0 15 0
Total Pottery	12	8	7 15 0
CLASS W.—Foreign.			
Devon Bull	1	1.	2 10 0
Stallion, Agricultural	4	1,2.	6 0 0
Blood Stallion	2	1,3.	6 0 0
Merino Ram	2	1,2.	2 10 0
Two Merino Ewes	2	1,2.	2 10 0
Plough	22	1,2,3,4,5.	4 5 0
Subsoil Plough	3	1.	1 0 0
Pair Harrows	1	1.	1 0 0
Fanning Mill	2	1.	1 0 0
Threshing Machine	3	1,2.	4 10 0
Seed Drill or Barrow	6	1,2.	1 10 0
Straw Cutter	10	1.	1 0 0
Smut Machine	0	0.	0 0 0
Portable Grist Mill	1	1.	2 10 0
Grain Cracker	1	1.	1 10 0
Root Cutter for stock	1	1.	1 0 0
Corn and Cob Crusher	2	1.	1 0 0
Clover Machine	1	1.	1 5 0
Reaping Machine	3	1.	2 10 0
Cultivator	4	1,2.	1 15 0
Assortment Agricultural Implements and Edge Tools	1	1.	5 0 0
Total Prizes class —	72	31	£50 5 0

Discretionary Entries and Prizes,

Embracing articles not enumerated in the published Prize List. The items cannot well be given in detail, as it would occupy two much space, nearly every entry under each general heading being a different article—and the articles being of Foreign and Canadian growth and manufacture indiscriminately, but the majority Canadian.

Figures in 2nd column from the left denote the whole number of Prizes.

Horses, Cattle, Sheep, &c.	45	8	£ 6 0 0
Poultry, &c.	16	3	9 15 0
Horticulture, Fruits, Seeds, &c.	79	38	17 10 0
Flour, Meal, Pot and Pearl Barley, specimens Baking, &c.	18	3	2 5 0
Implements, Tools, Machinery, Models, and General Manufactures in Wood and Metal, &c.	178	41	47 5 0

Discretionary Entries and Prizes—Continued.

Textile Fabrics, and Manufactures of Wool, Cotton, Linen, Furs, Leather, &c.	51	18	11 0 0
Animal Extracts, as Glue, &c., and Manufactures of Bone, Horn, Hair, &c.	13	3	2 0 0
Drugs, Chemicals, Condiments, &c.	10	2	0 15 0
Scientific Apparatus, and Expositions, &c.	11	3	3 0 0
Specimens of Ladies' Work, including Hamilton Carpet, &c.	27	5	8 15 0
Fine Arts, &c.	38	13	12 10 0
Indian Specimens, &c.	14	1	0 15 0
Saccharines, Salts, Oils, &c.	12	3	1 0 0
Other Miscellaneous Entries	11	2	0 12 6
Total Discretionary Department	523	143	£114 7 6

RECAPITULATION.

ARTICLES.	Total Number of Entries.	Total Number of Prizes.	Tot'l Amount
CATTLE.			
Durhams	81	37	£ 82 5 0
Devons	30	20	48 5 0
Herefords	5	5	20 5 0
Ayrshires	21	17	49 0 0
Grade Cattle	33	14	27 10 0
Fat Cattle	21	11	33 0 0
Total Horned Cattle	191	194	260 5 0
HORSES.			
Horses, class F.	212	31	£118 0 0
Thorough-bred Horses	16	10	38 0 0
Total Horses	228	41	156 0 0
SHEEP.			
Leicesters	79	18	£32 15 0
South Downs	39	18	32 15 0
Merinos and Saxons	33	15	31 0 0
Fat Sheep	18	6	12 0 0
Total Sheep	169	57	108 10 0
PIGS.			
Pigs, Large Breed	33	11	£20 0 0
Do. Small Breed	15	8	15 10 0
Total Pigs	48	19	35 10 0
MISCELLANEOUS.			
Poultry	57	14	£ 5 2 6
Agricultural Productions	336	85	123 10 0
Horticultural Products	482	121	50 5 0
Agricultural Implements	136	56	73 10 0
Diary Products, &c.	82	19	22 5 0
Leather and Furs	115	43	29 0 0
Manufactures in Metal	53	26	25 0 0
Cabinet-ware, &c.	29	22	19 2 6
Woolen and Flax Goods	56	23	17 10 0
Ladies' Department	229	44	26 2 6
Fine Arts, &c.	201	43	59 10 0
Bookbinding, &c.	30	9	9 10 0
Indian Prizes	3	1	0 5 0
Pottery	12	8	7 15 0
Foreign Class	72	31	50 5 0
Discretionary Department	523	143	114 7 6
Grand Total	3042	909	1193 5 8

	Articles Enumerated.	No. of Prizes Offered.	Am't Offered.
Prizes *offered* in the List published before the Exhibition	425	1136	£1423 6 9
Difference in amount between Prizes offered and those awarded		227	£229 15 9

Messrs. Jacques & Hay's Cabinet Department.

We omitted to notice in its proper place Messrs. Jacques & Hay's Cabinet Department. The subjoined description of that truly admirable exhibition of Canadian workmanship we extract from the Family Herald. The furniture was arranged in a small, single-roomed cottage, 21 feet by 17 inside, with three windows and a door, erected by themselves, and nicely hung with crimson and drab damask, and carpeted with rich Brussels. It contained a unique display of walnut cabinet furniture. On the right hand was a three-door Ladies' Wardrobe, made for C. H. Turner, Esq., of Rook's Nest, Surrey, England, and valued at £35. The door panels are veneered with a very rich curl, and the mouldings are broken in the centre of the circle, by a carved ornament, The inside is all finished in birds-eye maple, and finely polished. On the left hand stood the principal attraction,—a very magnificent French Bed, with an elaborately-carved foot board and pediment. In the centre of the foot-board is a Madonna and child, boldly carved, surrounded by a graceful wreath of convolvulus. combined with a garland of flowers, copied from nature, including the dahlia, German aster, rose, and convolvulus, all neatly grouped and carved in relief. On the top of the pediment is a Cupid, with a bird on its finger, and at each end, suspended from a scroll, is a group of fruit, also taken from nature. The pillars are closely in keeping, being surrounded with groups of convolvulus on the upper part, and hung with wheat and wild flowers on the under part. The rails are also tastefully decorated with raised panelling. This bed, worth about £60, was got up expressly for the Exhibition, by Messrs. Jacques & Hay, and designed and the principal parts executed by Mr. Charles Roger, Designer and Carver for the establishment. Beside the bed stood an antique Confessional chair, made for Fred. Widder, Esq. The back and seat are covered with very elegant sewed work, executed by one of Mr. Widder's daughters. The carving is a combination of the pink and tiger-lily. The value of the chair, without the needle-work, is about £10. In one corner was a very elaborately-carved French Card Table, forming, when folded, a very handsome pier table. In the opposite corner was a small ornamental table, with a pretty good specimen of dining room chair, done in Morocco, standing beside it. In the centre, between the bed and the wardrobe was a fancy drawing room table, with four truss legs and oval top of Italian Marble. The rails are carved in relief and partly fretted. This table has been purchased by Mr. Chancellor Blake. It is worth about £14 10s. At the back of the table stood a French Chair done in rich French Damask of an elegant style, and very tastefully finished. This completed the furniture of Messrs. Jacques & Hay's rural cottage, and gives a very favourable idea of the kind of work turned out of the establishment, and speaks highly for the refined taste, skill in design, and mechanical ability of Mr. Roger.

"High Bridge," Portage, New York.

Those of our readers who attended the opening of the Buffalo and New York City Railroad, will remember the immense Wooden Bridge which SPANS the Genesee Valley at Portage in Wyoming County, and which formed the chief object of interest on that occasion;—through the kindness of Mr. Leland, of the Ontario, Simcoe and Huron Railroad, we are enabled this month to give an illustration of the Bridge in question with some particulars in reference to its construction.

The Buffalo and New York and City Railroad, is one of the Branch Roads which have sprung from the New York and Erie Road and is the more especially interesting to us as bringing the six foot guage to our frontier, and which will at an early date be continued to the mouth of the Niagara River, when it will form one of the many routes of travel which will connect advantageously with the lines of Road now being built in Canada.

At Portage, the fruitful valley of the Genesee, famed at other points for its gentle slopes and teeming farms, is contracted to a deep and narrow gorge, through which the river dashes over three successive falls of about three hundred and fifty feet, between almost perpendicular banks of rock, piled in horizontal strata, of from ten to thirty feet in thickness, to a height immediately below the middle fall of about eight hundred feet. Thirty yards above the Upper Fall, at a point where the banks are eight hundred feet asunder, the Railroad crosses at a height of 234 feet above the bed of the river—viewed from the foot of the fall, which adds an hundred feet to the height of the structure, a passing train, relieved against a clear sky, has a wonderful and beautiful appearance—while the view from the train, embracing as it does, a large portion of Wyoming, is one of surpassing grandeur.

The Bridge was designed by Mr. Silas Seymour, the Chief Engineer to the Company, and the successful economy with which he has succeeded in overcoming the difficulties opposed to him, is entitled to great praise, especially when we take into account the short space of time in which the works were completed. The general design of the Bridge will be understood from our Drawing. The Piers on which the '*Trestles*' rest are of the best Ashlar Masonry, of compact Sandstone obtained from the Banks of the River; their base is 75 feet by 15 feet; they are carried up with a slight batter to a height of 30 feet above the Bed of the River, and coped with heavy Limestone Blocks. Upon these are placed the Timber Trestles (as shown in the Drawing), connected with each other in a very secure manner, by a system of Braces and Girders.

The Trestles are 190 feet in height, from the top of the Piers. At their base they are composed of 21 Vertical Posts, 14 inches by 14 inches, diminished in number to 15 at the top; and in size to 12 inches by 12 inches. The Lateral and Longitudinal Braces, and also the Girders, are 6 inches by 12 inches. Each Trestle or Pier is calculated to be capable of sustaining a weight of one thousand tons, in addition to its own.

The Trusses resting on the top, and connecting the several Trestles or Piers (which are 50 feet from centre to centre), are 14 feet in depth, and are composed of three Framed Girders, with *Main Counter* and *Sway Braces*, in the usual manner. On the top of these Trusses the Track is laid.

The whole length of the Bridge is eight hundred feet, and each span (with the exception of that across the canal, which 54 feet) is fifty feet. The arrangement of the structure is such that, when any particular piece becomes defective, it can be taken out and replaced without disturbing other parts of the Bridge. The occurrence of fire is, therefore, the chief danger to which it is liable, and against such a calamity every precaution is taken. Tanks of water are placed at convenient distances, and watchmen are employed day and night.

The total cost of the Bridge was about £35,000 currency, and the quantity of material employed in its construction is as follows:

Masonry	9,200 cubic yards.
Timber	133,500 cubic feet.
Wrought Iron	49 tons.

It was estimated that the cost of a stone viaduct would have been about £250,000, the interest of which, at 7 ℔ cent., would renew the present structure every two years. It was also

estimated that the interest on the cost of a wrought-iron Tubular Bridge, of 500 feet span, with stone piers and suitable approaches, would renew the present Bridge every third year.

The masonry was commenced on the 1st of July, 1851, and the first Locomotive passed over it on the 14th of August, 1852, embracing a period of only thirteen and a half months, a rapidity of construction which speaks volumes for the energy and zeal of the contractors, Messrs. Lauman, Rockafellow, and Moor, who were also the contractors for the whole line of the road, and have been long connected with public works.

The manner in which the Piers or "*Trestles*" were erected may be worthy of notice. They were commenced on the Eastern bank, and as each "*Trestle*" was completed the Trusses were placed on them, and the track laid; upon which a Travelling Crane was advanced, over-reaching the space to the next Trestle, and by means of which each stick of timber was let down to its place, until the whole of the next Pier was completed, when the Truss was placed and the Crane advanced as before.

This is, we believe, the highest Timber Bridge in the world; and though not notable for the development of any new principle of construction, it is worthy of *our* notice, for the *cheapness*, the quickness, and the completeness with which it has obviated a serious obstacle in the way of an important line of Railroad,—all matters of first-rate importance to us at this moment.

The New York Crystal Palace, Reservoir Square.

Reservoir Square, of which the municipal authorities have given the association a lease, lies west of the Croton distributing reservoir, and between that mighty mass of stone and the Sixth avenue. The precise distance from the reservoir to the Sixth avenue is 445 feet, and the width, north and south, from Fortieth to Forty-second street is 455 feet. On this piece of ground—not very favourable, it must be owned, either in shape or location—the association have determined to erect the building in question, of which the plans have been selected among several competitors, of whom may be mentioned, Mr. Saeltzer, the architect of the Astor Library; Mr. Downing, killed on board the Henry Clay; Mr. Eidlitz, Sir Joseph Paxton and others. The successful competitors are Messrs. Carstensen & Gildemiester.

The main features of the building are as follows:—The general idea of the edifice is a Greek cross, surmounted by a dome at the intersection. Each diameter of the cross will be 365 feet 5 inches long. There will be three similar entrances—one on the Sixth avenue, one on Fortieth, and one on Forty-second street. Each entrance will be 47 feet wide, and that on the Sixth avenue will be approached by a flight of eight steps. Each arm of the cross is, on the ground plan 149 feet broad. This is divided into a central nave and two aisles, one on each side—the nave 41 feet wide—each aisle 54 feet wide. On each front is a large semi-circular fanlight, 41 feet broad and 21 feet high, answering to the arch of the nave. The central portion or nave is carried up to the height of 67 feet, and the semi-circular arch, by which it is spanned, is 41 feet broad. There are thus, in effect, two arched naves crossing each other at right angles, 41 feet broad, 67 feet high, to the crown of the arch, and 365 feet long; and on each side of these naves is an aisle, 54 feet broad and 45 feet high. The exterior of the ridgeway of the nave is 71 feet. The central dome is 100 feet in diameter—68 feet inside from the floor to the spring of the arch, and 118 feet to the crown; and on the outside, with the lantern, 149 feet. The exterior angles of the building are ingeniously filled up with a sort of lean to, 24 feet high, which gives the ground plan an octagonal shape, each side or face being 149 feet wide. At each angle is an octagonal tower, eight feet in diameter, and 75 feet high. Each aisle is covered by a gallery of its own width, and 24 feet from the floor. The famous old church of San Vitalis, at Ravenna, is, by the way, the only instance of any considerable building that we at this moment recollect, of octagonal shape—but its diameter is only 128 feet.

Now, a few words as to the size and proportion of this edifice. On entering, the observer's eye will be saluted by the vista of an arched nave, 41 feet wide, 67 feet high, and 365 feet long; while, on approaching the centre, he will find himself under a dome, 100 feet across, and 118 feet high. A few comparisons will show a little what this will look like. The Croton Reservoir is itself 40 feet high, so it will be quite overtopped. Trinity Church is 189 feet long, by 84 feet wide, and 64 feet high. The City Hall is 216 feet long, 105 feet wide, and, including the attic, 85 feet high.

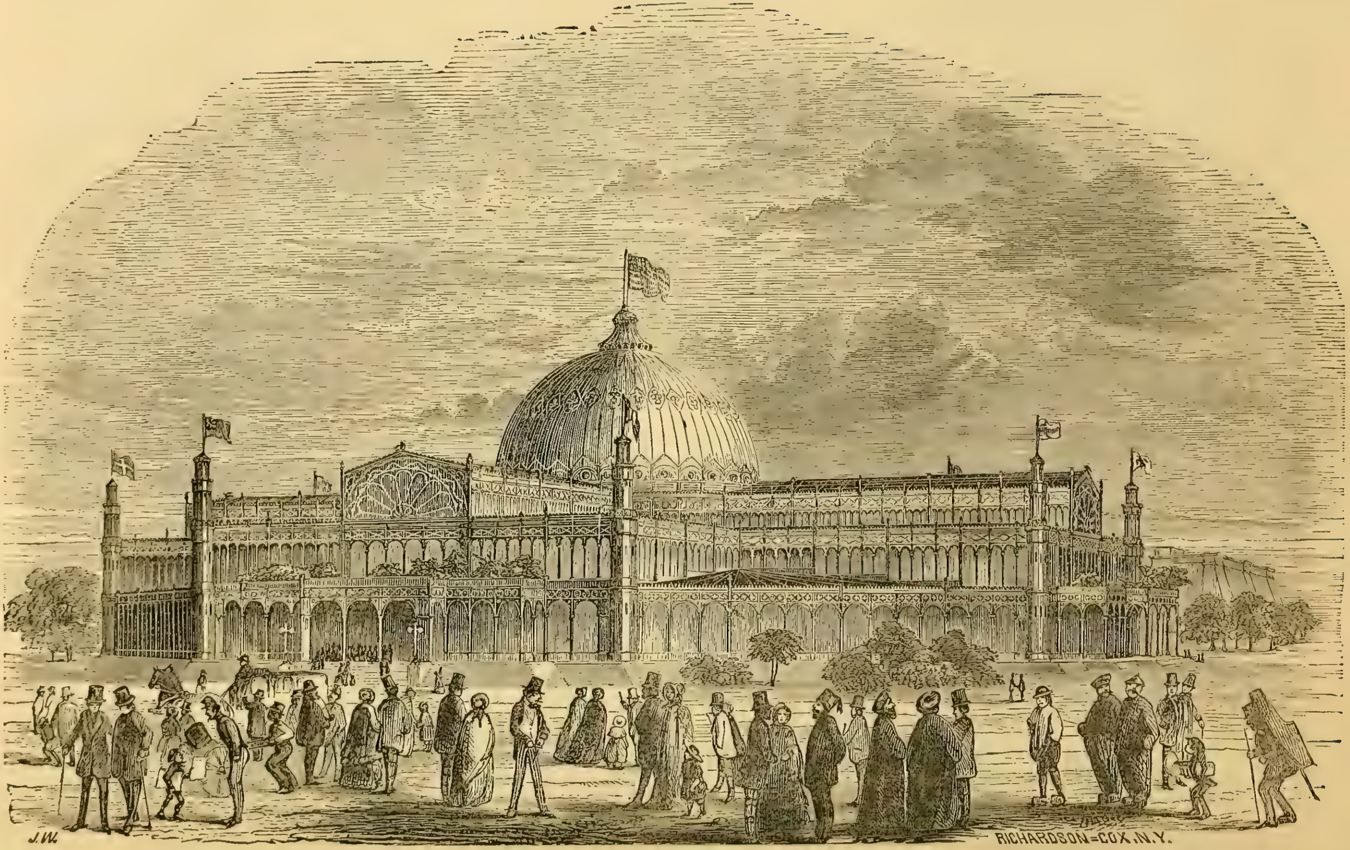
The Reservoir square nave will thus be twice as long as Trinity Church, and nearly twice as long as the City Hall.

The Capitol at Washington comes somewhat nearer. That, including the wings, is 352 feet in length, and each wing is 121 feet deep; the rotunda is 95 feet in diameter, and, to the top of the dome, 120 feet high. So, if the eye could have a clear sweep from the extreme end of the Senate chamber, across or through the Rotunda, to the other extreme of the House of Representatives, the mind would get a pretty good idea of one-half of the Crystal Palace, for that building being as we have said a Greek cross of equal proportions, would present two vistas like this.

For aught we see, therefore, we must come to the inevitable conclusion, that this building will be larger, and more effective in its interior view than anything in the country. If so, the edifice will be a great show of itself.

This building contains, on its ground floor, 111,000 square feet of space, and in its galleries, which are 54 feet wide, 62,000 square feet more, making a total area of 173,000 square feet, for the purposes of exhibition. There are thus in the ground floor two acres and a half, or exactly 2—52-100; in the galleries, one acre and 44-100—total, within an inconsiderable fraction of four acres. There are on the ground floor one hundred and ninety columns, 21 feet above the floor, 8 inches diameter, cast hollow, of different thicknesses, from half an inch to one inch thick; on the gallery floor there are one hundred and twenty-two columns.

Now, to compare this building with some of the great foreign wonders: St. Paul's, of London, is five hundred feet long, and this beats the Reservoir square Palace. But, St. Paul's has only 84,025 square feet on its ground floor, and is thus, on the whole, decidedly smaller. St. Peter's Church, at Rome, is 669 feet long, and has 527,069 square feet. So that our Crystal Palace will be, on the ground floor, just half the size of St. Peter's—but, with the galleries, the available room in St. Peter's is only one-



NEW YORK CRYSTAL PALACE.

fifth larger. But the true rival will probably be thought to be the Hyde Park Paxton Building, now erecting at Sydenham. That building was 1,848 feet long, by 408 feet broad, thus giving, on the ground floor, seven hundred and fifty-three thousand nine hundred and eighty-four square feet, and, with the transept, eighteen acres. This building covers only one-eighth of the ground occupied by the Hyde Park monster, but the available space, with the galleries, is about one-fifth or one sixth. But it is plain enough that, independent of the question where so large a building as the Paxton Palace should or could be put, it would be very absurd to erect one here of such gigantic dimensions. The Atlantic is not yet quite abolished, and the business of crossing the ocean, to fill the building with goods worthy to be exhibited, would be a good deal more serious than crossing the English Channel. The New York Crystal Palace is large enough for every purpose, in all conscience. As to the architectural effect and beauty of the building, there will be no sort of comparison. The general idea of the Reservoir square building—that of a Greek cross with a dome over the centre—though not by any means new, is one of approved architectural effect.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—September, 1852.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario : 108 feet

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch.
				"	"	°	°	°	°												
b	1	29.738	29.655	29.632	29. 670	57.4	81.8	68.4	70 9	0.424	0 637	0 555	0.545	92	60	83	75	Calm.	S S W	Calm	- -
c	2	.601	.453	.378	. 469	55.3	78.2	77 5	71.5	.306	.570	.749	.573	71	61	82	75	Calm.	S b E	S W b S	0.060
	3	.506	.583	.691	. 619	60.7	74.3	59.2	64.2	415	.383	.352	.385	80	47	71	67	S W	W N W	NW b N	- -
e	4	.765	.802	.864	. 818	50.6	71.4	54.4	59.7	.314	.462	.286	.366	86	62	69	73	Calm	E b S	N N E	- -
c	5	.936	.835			46.7	72.2			.274	.474			88	62			S W b W	S E b S	Calm	- -
bd	6	.871	.810	.809	. 829	49.0	77.3	66.4	66.3	.291	.459	.450	.430	85	51	71	69	Calm	S	S S W	- -
c	7	.868	.842	.847	. 855	51.8	79 0	59.9	65.6	.346	.510	.416	.453	91	53	82	74	W b S	S	E b N	- -
c	8	.902	.909	.847	. 883	53 5	74.7	58.9	64.5	.375	.595	.375	.453	93	72	77	76	Calm	E S E	E N E	Inap
e	9	.840	.752	.667	. 742	61.1	70 8	68 6	67 4	.416	.641	.650	.578	79	88	97	88	N N E	S b E	E N E	0.080
	10	603	.584	.586	. 591	67.4	76.1	62 5	69.0	.585	.527	.480	.530	90	60	87	78	N W b N	NW b N	N b W	- -
c	11	.540	.338	.200	. 346	59.6	68 9	63.9	64.4	.456	.557	.510	.506	91	81	88	86	N b W	E b S	N E	1.070
c	12	28 910	.042			55 3	60.7			.364	.335			85	65			S b W	W	W N W	0.055
a	13	29.364	.392	.526	. 436	39.1	56 5	42.1	47.3	.206	.211	.216	.215	87	47	81	69	W S W	W b S	W b S	Inap
a	14	.604	.579	.628	. 609	36.1	60.7	47.4	49.3	.193	.295	.273	.261	91	57	85	76	Calm.	S S E	N N E	- -
a	15	.733	.777	.863	. 799	41.1	57 9	42.9	48.5	.223	.307	.236	.265	87	65	87	79	N N W	S S W	Calm	- -
c	16	.973	.961	.955	. 963	37.0	57.4	44.9	48 6	.207	.276	.239	.252	95	60	82	76	N	S	N N E	- -
ac	17	.984	.951	.917	. 951	40.1	61.2	48.4	51.2	.209	.321	.278	.270	85	61	83	73	N b E	S E b E	N E b E	- -
ac	18	.918	.860	.810	. 853	45 9	64.1	57.4	56.6	.288	.379	.333	.356	94	65	83	80	N N E	E b S	Calm	0.035
c	19	.735	.656			55.6	66 3			.403	.548			93	87			Calm.	E b S	N W	0.110
e	20	.814	.738	.586	. 699	52.8	51.5	52.5	52.9	.323	.343	.373	.350	82	91	93	89	N b E	N E b E	E N E	1.160
e	21	.402	.304	.550	. 422	58 2	65 8	56.1	60 6	.456	.480	.308	.405	96	77	70	78	E N E	S S W	W b S	Inap
d	22	.640	.745	.889	. 768	52.0	61.8	43.6	52.9	.312	.293	.261	.276	82	54	93	72	W S W	NW b W	Calm	- -
c	23	.964	.935	.855	. 912	41.3	57.5	45 9	49.9	.230	.340	.280	.293	89	74	91	83	N b W	S S E	E	- -
c	24	.818	.742	.691	. 741	48.6	60 0	53.1	54.6	.305	.397	.254	.336	90	79	64	80	N N E	E	N E b N	- -
ab	25	.606	.394	.239	. 412	52 0	60 3	53.1	55.2	.332	.364	.390	.368	87	71	98	85	N b E	E N E	NW b W	0.940
b	26	.442	.388			42 4	57.2			.242	.275			90	60			S	W	N W	Inap
ab	27	.631	.635	.604	. 624	40.8	49.5	48.8	46 5	.225	.233	.255	.236	89	67	75	76	N W b W	S S E	S E	0 095
ab	28	.455	.547	.743	. 590	48.8	53.5	41 9	47.5	.309	.368	.214	.286	90	91	81	86	Calm	Calm	N W	0.025
e	29	.851	.850	.821	. 833	36.3	51.0	45 4	44.1	.164	.248	.269	.226	77	68	90	80	N b E	S S E	S b W	- -
d	30	.808	.794	.807	. 805	38.6	60.0	48.5	50.4	.194	.344	.296	.297	83	68	88	82	NE	S E b S	Calm	- -
	M	29.7230	29.6916	29.6925	29.7015	49.04	64.66	54 34	56 92	0 312	0.405	0 360	0.366	87	67	83	78	Ml's 2.68	Ml's 7.40	Ml's 3.63	3.630

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1085.74	1216.44	997.03	846.30

Mean velocity of the wind - - 4 60 miles per hour.
Maximum velocity - - - - - 16.8 ml's per h'r, from 11a.m. to noon on 22nd
Most windy day - - - - - 12th : Mean velocity, 9.20 miles per hour.
Least windy day - - - - - 30th : Mean velocity, 1.70 ditto.
Most windy hour - - - - - 2, p.m. Mean velocity, 7.40 ditto.
Least windy hour - - - - - 4, a.m. Mean velocity, 2.56 ditto.
Mean diurnal variation - - - 4 84 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Thunder Storms.—2nd, lightning, thunder, and rain, 10 P.M. to midnight. 11th, thunder, lightning, and rain, 10 P.M. 25th, thunder storm and heavy rain, 8 to 9 P.M.

Highest Barometer - - 30 006, at 8 A.M., on 17th } Monthly range:
Lowest Barometer - - 28.910, at 6 A.M., on 12th } 1.096 inches.
Highest observed Temp. - 81.8, at 2 P.M., on 1st } Monthly range:
Lowest regist'd Temp. - 35.8, at A.M., on 14th } 46.0
Mean Highest observed Temperature - - 64.92 } Mean daily range:
Mean Registered Minimum - - - - - 47.16 } 17.76
Greatest daily range - - - - - 28.4 from 2 P.M., on 4th, to A.M., on 5th.
Warmest day - - 2nd - - - Mean Temperature - 71.53 } Difference:
Coldest day - - - 29th - - - Mean Temperature - 44.07 } 27.46
First frost of the season on the 13th, at 5 A.M.

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for September.

Year.	Temperature. Mean.	Max.	Min.	Range.	Rain. Days.	Inches.	Wind. Mean Velocity.
		°	°	°			Miles.
1840	53.97	70 2	29 4	40 8	4	1.380	--
1841	61 04	79 9	37.5	42.4	9	3.340	--
1842	55.20	83.5	28.3	55.2	12	6.160	--
1843	58.48	87.8	33.1	54.7	10	9.760	--
1844	57 97	81.5	29 6	51.9	4	0.230	--
1845	55.48	78.8	35 3	43.5	16	6.245	--
1846	62.76	84 0	39.0	45 0	11	4 595	--
1847	55.27	74.8	38.1	36.7	15	6.665	--
1848	53.77	80.9	29.5	51.4	11	3.115	5.81
1849	57 50	80.6	33.5	47.1	9	1.480	4.23
1850	56.54	76 0	31.7	44.3	11	1.735	4.78
1851	60.00	86.3	33.4	52.9	9	2.665	5.45
1852	56.92	81.8	36.1	45.7	10	3.630	4.60
Mean	57.30	80.47	33.42	47.05	10.1	3.923	4.97

REVIEWS.

The Anglo-American Magazine: Thomas Maclear, Toronto.—The fifth number of this excellent periodical has been laid upon our table, and continues to sustain its character as a very interesting and important addition to Canadian Literature. Mr. Maclear announces his intention of introducing into succeeding numbers of the *Anglo-American*, a general History of the American War of 1812, '13 and '14. We feel confident that a truthful relation of the stirring incidents of a war in which the people of this country bore so active and honorable a part, will secure for the enterprising proprietor of the Magazine, an extensive and remunerative support from the Canadian public.

The British Colonial Magazine: Henry Rowsell, Toronto.—The subjoined extract from the prospectus of this "*Weekly Journal of Literature, Science, Instruction and Amusement*," fully expresses its very comprehensive design:—

"The projectors of this Periodical believe that the time has arrived when, from the extent of its population, progress and prosperity, Canada is capable of supporting, and should possess, a Literary Journal of its own, and no longer remain dependant upon the United States for the gratification of a large portion of its intellectual necessities. Each number of this Journal will contain 24 pages of the choicest reading matter, selected from every available source, both Ancient and Modern, comprising:—Original Articles; Literary Intelligence from every quarter of the civilized world—from the "Great Metropolis" to the "Celestial Empire"; Interesting Discoveries by Sea and Land; Progress of the Arts and Sciences; Improvements in Manufactures; Notices of New Discoveries, and Investigations in History, Geography, Zoology, Botany, Entomology, Conchology, Mineralogy, Chemistry, &c. Nor will our fair friends be forgotten. Selections of the "Gems of Poesy" will be made occasionally from the productions of the best writers of the past and present day; and, as soon as practicable, arrangements will be entered into for the contribution of Original Articles by some of the first living Authors of Europe."

We shall be delighted to find the *British Colonial Magazine* fulfil the expectations which its high-sounding title, and the almost illimitable field of Literature it proposes to range over, naturally excite. It has already reached its sixth number; we shall, however, postpone adverting to its varied contents until future numbers confirm or modify the opinions we have formed.

Progress of Electric Telegraphing.

The European Telegraph Company are constructing a new line from Dover to London by the old coach road, leading through Deptford, Greenwich, Shooter's-hill, Dartford, Gravesend, Rochester, Chatham, and Canterbury. The line is sunk in the old turnpike road. The copper wires are encased in gutta percha, and deposited in a trough constructed of kyanised timber, which is placed in trenches, eighteen inches from the surface of the ground. The trenches are dug and the wires are laid at the rate of one and a half mile per day. Six separate wires are deposited in each box, by from two hundred to three hundred workmen. The wires are to be divided in the proportion of two for the Paris, two for the Brussels, and two for the Mediterranean routes.

The British Telegraph Company are constructing a line on the old system between Glasgow and Greenock, on that railway. The line would have been more important before the efforts made to establish submarine telegraphs. Glasgow, by the steamers to Belfast, furnished the latest telegraphic intelligence to Ireland, and the formation of this line would have brought each day's intelligence one hour farther down. By that route all British telegraphic intelligence to four P. M. of the previous day would have been published in the North of Ireland each morning.

We understand that a line will be formed from Edinburgh to Perth, Dundee, Aberdeen, and the North East of Scotland. That line appears to be required, and will probably answer as a commercial speculation. The business and the population to be accommodated by the line are very considerable. A melancholy example of its necessity occurred on the recent death of the Duke of Wellington. That event occurred on the afternoon of Tuesday, the 14th ult., and was known in Edinburgh and Glasgow, a distance of 460 to 470 miles, from the telegraphic intelligence on the same afternoon. The distance of Balmoral by the ordinary routes from either Glasgow or Edinburgh is 120 to 130 miles. Its distance from Aberdeen is 50 miles. The Court and the Premier were at the date resident at Balmoral. The information did not reach the Royal residence until the afternoon of the 16th. If a telegraphic line had been completed to Aberdeen, it is obvious that the intelligence might have been accelerated by six or seven hours. This event was not calculated to produce great and immediate political results; although England contains not the remains of any man more generally honoured than the late Duke of Wellington; but it is obvious that events requiring immediate measures might occur under the same circumstances, and that, therefore, this proposed line is one of great public importance, irrespective of its commercial merits, which are, we think, sufficient to repay the outlay necessary in its formation.

The following appears in the Times:—

"An amalgamation between the Electric Telegraph Company and the Irish Submarine Telegraph Company, recently incorporated by Royal charter, is being carried out for effecting this object. The principle upon which the cable now manufacturing at the Millwall works, where the wire ropes for the Admiralty are made, is constructed, differs from that hitherto adopted, and consists in insulating the interior wires by means of india rubber as well as gutta percha. These, after being laid up or twisted into a rope, are passed through an anhydrous solution, and then covered with spun-yarn, and formed into a hempen rope, which is again passed through another, but different anhydrous solution. The whole is then passed through a wire rope machine, worked by steam, which encases the interior core in a metallic wire rope, formed of twelve separate strands of six wires each, or seventy-two wires, in all forming a solid three inch cable. These plaits or close convolutions of wire are thought preferable to the single spiral wire, as calculated to give greater flexibility and strength, and to prevent any portion of the cable from becoming unstranded. As it is manufactured it is payed off the machine and formed into a Flemish coil. The cable is seventy miles long, allowing ten miles for contingencies, the distance from shore to shore being only sixty miles. There are to be four wires, making a total of two hundred and eighty miles of copper wire, and of this one hundred and eighty miles are completed."

On Wednesday a new line of pipe was being laid down along the Strand to connect the General Post-office with the Admiralty, Houses of Parliament, and the Telegraph Station at Charing cross.

The Great Telescope on Wandsworth Common.—The following are the particulars of the refractive powers and focal lengths of the lenses in the great achromatic telescope at Wandsworth-common, made by Mr. Thomas Slater, of Somers-place West, Euston-square:—The object glass is achromatic, consisting of plate and of flint glass. The plate glass was cast by the Thames Plate Glass Company, and is a most excellent piece, being perfectly homogeneous and free of striæ. The refractive index of this glass turned out to be 1.5103, and it is worked to a positive focal length of 30 feet 1½ inch. The flint glass is a very superior piece, and does great credit to the manufacturers, Messrs. Chance, of Birmingham. It is of uniform density, and very transparent; its refractive index is 1.6308, and it is made to a negative focus of 49 feet 10½ inches. The combined focal length of the plate and flint glass lenses is 76 feet to parallel rays; the focal length will be 85 feet only to objects at about 700 feet distance from the object glass. The diameter of the image of the full moon in this telescope is about 8 inches, and Mr. Slater has made an eye piece of that diameter, having a magnifying power of 125; another eye piece, which takes in about half the moon's diameter, has a magnifying power of 250; other eye pieces are also made, the powers of which vary from 500 to 3000.

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the Improvement in Art, and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto.

THE CANADIAN JOURNAL.

OPINIONS OF THE PRESS.

THE CANADIAN JOURNAL.—We have to acknowledge the receipt of the first number of the *Canadian Journal*, a record of the proceedings of the Canadian Institute, and devoted to industry, science, and art in general. The typography is by our neighbour, Mr. Scobie, and does him infinite credit. The paper also is capital, and everything about the work has a highly respectable appearance. The introductory article is excellent, containing very appropriate and just ideas, expressed in easy and graceful style. Altogether, the work is exceedingly creditable to its promoters, and we hope that it will meet with hearty support from the public. We recommend an examination of the first number as the best inducement to subscribe to the work.—*Globe.*

THE CANADIAN JOURNAL.—We have received the first number of this periodical, published by Mr. Scobie, for the Council of the Canadian Institute. It contains 24 pages, 4to., and is neatly printed, on the best quality of paper. It is to appear monthly. We are glad to record the appearance of a scientific periodical like this in our own country, and judging from the specimen before us, the work will be conducted with ability. The first number contains a variety of interesting scientific articles, both original and selected.—*Christian Guardian.*

THE CANADIAN JOURNAL.—The August number of this valuable monthly publication has been received. From a perusal of its well filled pages we note that it is a record of the progress of Canadian Arts and Sciences and general industry; and contains information adapted to the wants of the scholar and practical man. Nor will its usefulness be confined to this country, for in its columns we find copious gleanings from European Journals, treating of the kindred science in other lands. The *Journal* is published for the Canadian Institute, by Mr. Scobie, of Toronto, and furnished to non-subscribers of the "Institute," at 15s. per annum.—*Barrie Herald.*

THE CANADIAN JOURNAL.—We have to acknowledge the receipt of *The Canadian Journal*, a repertory of Industry, Science and Art, and a record of the proceedings of the Canadian Institute, published by Hugh Scobie, Toronto.

We have carefully looked over the number now before us, and we are bound to say, that it fully supports the highest aspirations that might have been formed by the friends of Canadian progress in the Arts and Sciences. It contains many highly interesting and even fascinating essays, original and selected. Those of the latter character have been chosen with great care, while many of the former, are not only cleverly written, but contain many entertaining and instructive suggestions. The *Journal* contains several very fairly executed wood Engravings; one of the Canadian Department of the Great Exhibition, and several of useful inventions in Arts and Manufactures; and also of Farming Implements. We trust the *Canadian Journal* will be taken up with spirit, and receive the patronage, not only of men of literary and scientific attainments, but also of the honest Yeoman, who desires to economise his labour, and to render the cultivation of the earth a profitable pursuit; and of the Manufacturer and Artizan, whose professional skill, will every month receive fresh acquisitions in knowledge and the Arts, from this valuable and interesting publication.

We observe that all remittances are to be forwarded to the Treasurer of the Canadian Institute: by the Council of which body, the work is sent forth to the public.—*Patriot.*

THE CANADIAN JOURNAL.—We have to acknowledge the receipt from Mr. Scobie, the publisher of the second number of "the *Canadian Journal*, a Repertory of Industry, Science and Art; and a record of the proceedings of the Canadian Institute." As a specimen of Canadian typography it is one of the very best we have ever seen, and the illustrations, with one exception, are admirably executed. The contents seem, from the hasty glance we have been enabled to give them, to be of a very superior kind. We can only say, that it will be a high honour, indeed, to the progress of the arts and sciences in Canada, if such a periodical is properly sustained among us. In order that this result will be achieved, "material aid" is necessary, and we recommend all of our readers, who feel an interest and a just pride in the progress of their country to support this publication, at the same time, we may say a word in favour of the Canadian Institute, under whose auspices the journal is being published.—*Montreal Gazette.*

THE CANADIAN JOURNAL.—*Toronto*: Hugh Scobie. This is published as a record of the proceedings of the Canadian Institute, and is one of the best publications that has as yet proceeded from the press in Upper Canada. It is beautifully printed and illustrated.—*Mirror.*

THE CANADIAN JOURNAL.—Hugh Scobie, Toronto. The *Canadian Journal*, designed as a Repertory of Science, Industry and Art, is a publication whose appearance we have looked for with considerable interest, and so far our expectations have by no means been disappointed. The number which has reached us contains a variety of original papers and general scientific intelligence of the most valuable description. Agriculture, Engineering, Geology and Meteorology, each receives a very considerable share of review; and so far as talent of a high order is necessary to the success of such a work, the original papers bear sufficient testimony that the *Journal* bids fair for a permanent place among the literary publications of the day. The superior typographical appearance of the *Canadian Journal* will tend still further to enhance its merits. On such grounds we are able cordially to wish it success.—*Examiner.*

THE CANADIAN JOURNAL.—The first number of this Scientific Monthly is now before us. To the man of science this work must be welcome, while within its pages the studious mechanic and farmer will find much to stimulate improvement.—*Brockville Recorder.*

THE CANADIAN JOURNAL is published by H. Scobie, Esq., for the Council of the Canadian Institute. It treats on Scientific and Mechanical subjects, and contains some well executed illustrations on wood. This is a national work, and should be liberally supported. It is intended to issue monthly, and will be furnished to subscribers at 15s. a year in advance. To members of the Institute, the *Journal* will be transmitted without charge. The annual subscription for membership, including entrance fee, is only four dollars.—*Dundas Warder.*

THE CANADIAN JOURNAL.—We have from Toronto, under this name, a "Repertory of Industry, Science and Art, and a Record of the proceedings of the Canadian Institute," which promises to be well conducted. The Canadian Institute, when first proposed in 1849, was to be composed mainly of surveyors, engineers, and architects; but ultimately its professional character was changed to one of general description, and a royal charter of incorporation was obtained in November, 1851.—*The Builder, (London, Eng.)*

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, NOVEMBER, 1852.

CONTENTS:

PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

The Canadian Journal.

TORONTO, NOVEMBER, 1852.

The Canadian Institute has just completed its first year of existence under the Royal Charter of Incorporation, which was granted in November of last year. It was not until the beginning of April, 1852, that the officers required by the Charter for the government of the Institute entered upon their duties.

Thus far its pecuniary resources have been limited to the annual subscriptions of its members, and its hope of future usefulness and success in the great work of collecting and diffusing useful information, to the zeal of a few whose confidence in the possibility of organizing a powerful scientific and literary society, with ramifications throughout the country, has been sufficiently warm and vigorous to infuse into them that ardour which almost invariably commands success.

We shall not anticipate the report of the Council to be laid before the Institute on Saturday, Dec. 11th; it is our grateful privilege, however, to announce that one oppressing difficulty towards the extension of the Canadian Institute has been most happily removed.

The Provincial Parliament has generously responded to the petition of the Institute for pecuniary encouragement, and by voting Two Hundred and Fifty Pounds for the purposes of the Institute, gives to it the means of developing its latent resources and enables it to call at once into vigorous and united action, a large amount of native wealth and native power in science and literature, which languish only for the want of opportunity to bring them to the light, and direction to indicate the course they should pursue.

We have also much pleasure in announcing that the future meetings of the Canadian Institute will be held in the Hall of Assembly, Parliament Buildings, Toronto. That magnificent apartment, together with three adjoining rooms, having been kindly placed at the disposal of the Institute by the Commissioners of Public Works. Subjoined is the reply to the application of Capt. Lefroy, R. A., F. R. S., on the part of the Institute:—

PUBLIC WORKS,
QUEBEC, 11th Nov., 1852.

SIR,—

I am directed to acknowledge the receipt of your letter of the 10th instant, applying, on the part of the "Canadian Institute," for permission to occupy the Chamber in the Parliament Buildings at Toronto, together with some other rooms, and in reply, I have to inform you that the Commissioners are willing to grant you the use of the Hall of Assembly, with the three rooms adjoining it, to be occupied by the "Canadian Institute," so long as it may not be required by the Government; and upon condition that the former shall make an arrangement with the Insurance Company relative to any additional risk. The Institute will also be required to arrange with Mrs. McElderry, the Keeper of the building, as to the times when they will use the building, in order that they may not meet with any difficulty as to access, &c.

I have the honour to be, Sir,
Your obedient Servant,
THOMAS BEGLY,
Secretary.

Captain Lefroy, R. A.

The second session of the Canadian Institute will commence most auspiciously, and if from the present we may draw conclusions respecting the future, this new proof which we have just recorded, of the desire of the Provincial Government to advance the interests of Science, Literature and Art in the Canadas, coupled with the willing courtesy of the Commissioners of Public Works, will unquestionably awaken both far and near a spirit of enquiry, annually producing useful and interesting results, if not—as we would hope—results of moment to the people of British America.

The Treasures of our Forests.

The products of the forest embrace the most important items of Canadian exports, and from their bulky nature secure to us a greater amount of intercourse with Great Britain than all other articles of export or import collectively.

The relation which the products of the forest bear to other productions, in a commercial point of view, is represented below for the years 1849, 1850, and 1851:—

1849.

Value of the products of the forest exported	£1,327,537
" of all other productions	1,000,027
Balance in favour of the products of the forest	£327,510
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£1,009,669
Value of all other productions exported to Great Britain	338,755
Balance in favour of productions of the forest exported to Great Britain	£670,914

1850.

Value of the products of the forest exported	£1,360,734
" of all other productions	1,309,264
Balance in favour of products of the forest	£51,470
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£971,375
Value of all other productions exported	229,474
Balance in favour of products of the forest exported to Great Britain	£741,901

1851.

Value of the products of the forest exported	£1,509,545
" of all other productions	1,315,085
Balance in favour of products of the forest	£184,460
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£1,180,000
Value of all other productions exported	325,350
Balance in favour of products of the forest exported to Great Britain	£854,658

Hence, it appears, that the value of the products of the forest exported to Great Britain, has steadily increased during the last three years; the numbers indicating those values, being in 1849, £670,914; in 1850, £741,091; in 1851, £854,658.

Table showing the kinds of forest productions exported, in 1851:—

ARTICLES.		Value of Exports.	Value of Exports to G. B.
Ashes, Pots, brls.	27,944	£172,496	£153,528
Pearls, do.	8,463	43,865	42,282
Timber, Ash, tons	3,018	3,726	3,710
Birch, do.	4,043	5,505	5,504
Elm, do.	35,644	49,146	49,072
Maple, do.	449	435	404
Oak, do.	40,976	57,460	47,425
Pine, White, do.	453,435	400,972	381,370
Red, do.	91,145	114,875	114,524
Tamarack, do.	4,356	1,415	517
Walnut, M feet	1,194	5,934	113
Basswood, Butternut and Hickory, do.	79	243	43
Staves, Standard, Mlle.	1,195	20,769	15,519
Other, do.	4,509	92,044	88,213
Battens, Knees, Scantling, Tree Nails, &c., pieces	729,059	11,060	525
Deals, do.	3,526,647	239,369	238,931
Planks and Boards, Sup. Feet	120,175,596	209,108	855
Spars, Masts and Handspikes, pieces	9,482	14,101	12,505
Lath and Firewood, cords	17,356	11,641	8,142
Shingles, mille.	20,972	7,880	......
Saw Logs, No.	34,425	8,642	......
Other Woods	......	11,364	887
Furs and Skins	......	28,085	7,939
Total		£1,510,135	£1,171,998

It is thus seen at a glance that forest productions, exclusive of Pot and Pearl Ashes, and the Furs and Skins of animals, are of the highest economic importance to us, and yet who, that is acquainted with the diversified trees of our forests, can fail to perceive that very extensive sources of revenue are neglected from ignorance of the value of many species of wood, which are especially adapted to the peculiar purposes of artificers in Great Britain, but do not appear in the enumerated list of exports.

We are led to these remarks in consequence of the information respecting forest productions which the recent Exhibition of All Nations in London has brought to light.

Not less than one hundred and thirty varieties of British wood were exhibited at that magnificent exposition of industry. Among them, it may be well to mention, specimens of apple, pear, plum, and apricot trees were introduced, in consequence of those woods being much sought after by toy manufacturers, turners, &c. For obvious reasons, such woods would possess little value in this country, either as an article of export or for the purposes of domestic manufacture.

Europe contributed forty-nine varieties of wood, most of them used in ship building, carpentry, furniture, and dyeing.

Asia contributed about two hundred specimens. The United States forty-two. Canada thirty-one.

We subjoin a list of the woods sent from the United States and Canada, remarking however, that some of the species enumerated in the attached list and credited to the United States, grow well and are abundant in Canada.

WOODS OF NORTH AMERICA.*

NAME AND PLACE OF GROWTH.	Weight per Cub. Ft. lbs.	oz	Specific Gravity.	REMARKS AND WHAT USED FOR.
Ash, American (Fraxinus)	35	10	·570	Tough, elastic, much used.
Ash, white—Upper Canada.	30	14	·494	
Balsam (Picea balsamea)—Upper Canada	19	0	·304	Carpentry.
Bass Wood (Tilia)—U. C.	25	0	·400	Even grain, like common limewood
Beech, white (Fagus americana)—U. S.	42	2	·674	
Beech (Fagus ferruginea)—Upper Canada	36	9	·585	Dry carpentry; the wood has more rufous tint than common beech
Birch, black (Betula nigra)	35	7	.567	Shipbuilding in Canada and Nova Scotia, but not a durable wood
Birch (Betula ——?)—U. C.	30	11	·491	An inferior wood
Box elder, ash-leaved maple (Acer Negundo)—U. S.	24	0	·384	
Butter nut (Juglans cinerea) Upper Canada	23	8	·376	
Butter wood . .	28	12	·460	Shipbuilding
Button wood, sycamore (Platanus occidentalis)—U. S.	26	8	·424	Much used for making bedsteads
Cedar (Larix ——?)—U. C.	18	6	·294	
Cedar, red or pencil (Juniperus bermudiana)—Bermuda	34	15	·559	Shipbuilding and for making pencils
Cedar, red (Juniperus virginiana)—U. S.	26	10	·426	For making pencils, but not so good as the junip. bermudiana
Cherry wood (Prunus —?) Upp. Canada	29	15	·479	
Cherry, wild (Cerasus virginiana) United States	32	3	·515	
Chesnut (Castanea vesca) U. S.	25	4	·401	
Coffee tree (Gymnocladus canadensis)—U. S.	40	7	·647	Hard, compact, strong, tough
Cypress (Cupressus disticha)—U. S.	22	13	·365	Grows to an immense size
Dogwood (Cornus florida)—U. S.	47	4	·756	Hard, close-grained strong
Elm (Ulmus americana)—U. C.	36	11	·587	
Elm, american rock .	36	3	·579	Shipbuilding
Elm, rock . . .	37	10	·602	"
Elm, swamp . .	33	10	·538	" preferred to English elm
Elm, white . .	34	5	·549	By wheelwrights
Elm, red (Ulmus fulva) U.S.	42	8	·680	
" " " .	31	2	·498	
Gum tree, sour, or black (Nyssa multiflora)—U. S.	40	6	·646	
Hack-berry (Celtis crassifolia)—U. S.	38	6	·614	Tough, elastic
Hackmatack (Larix americana)	37	9	·601	
do. do. do.	36	2	·578	Esteemed in British North America for shipbuilding
Hazel, wych, or Quebec rock elm Ulmus ?—Canada	34	2	·546	Shipbuilding
" " " " .	43	11	·699	
" " " " .	51	6	·822	
Hemlock (Abies canadensis) U. S.	23	0	·368	
Hemlock spruce—U. C. .	23	0	·368	Common carpentry
Hickory (Carya amara) U.S.	. .		. .	
Hickory, pignut (Carya porcina)—U. S.	49	8	·792	Stronger and better than any other kind of hickory
Hickory, shell-bark (Carya sulcata)—U. S.	43	2	·690	
Hickory ? . . .	47	8	·760	
Hickory (Juglans alba)—U. C.	48	2	·770	
Honey locust (Gleditschia triacanthus)—U. S.	40	6	·646	Very hard, splits with great facility

* Labelled and Classified by Mr. W. W. Saunders, at the Great Exhibition.

NAME, AND PLACE OF GROWTH.	Weight per Cub. Ft. lbs.	oz.	Specific Gravity.	REMARKS AND WHAT USED FOR.
Iron wood (Ostrya virginica)—U. S.	48	11	·779	
Judas tree, or red bud (Ceris canadensis)—U. S.	33	7	·535	Close-grained, compact
Locust (Robinia pseud-acacia)—U. S.	45	8	·728	Shipbuilding occasionally, chiefly for treenails
" " " "	41	11	·667	
Maple, soft (Acer eriocarpum)—U. C.	36	14	·590	
Maple, red, (Acer rubrum)—U. S.	38	5	·613	
Maple, sugar (Acer scchari-num)—U. S.	38	6	·614	
" " " "	39	6	·630	
Maple, bird's eye—U. C.	40	15	·655	Ornamental work by carpenters and joiners
Maple, curly—U. C.	36	10	·586	Common carpentry
Maple, var. bird's eye	36	0	·576	Ornamental work; a peculiar growth of the tree
Maple, hard—U. C.	39	10	·634	
Mulberry, red (Morus rubra)—U. S.	35	1	·561	
Oak (Quercus alba)—U. S.	47	14	·766	
Oak, white—U. S.	40	1	·641	
Oak, white—U. C.	44	4	·708	Shipbuilding
Oak, Quebec—Canada	33	11	·539	Shipbuilding, but not d'rble
" "	45	5	·725	Specimen of an inferior quality
" "	39	5	·629	Shipbuilding, but not in repute
Oak, Quebec white—Canada	53	12	·860	Shipbuilding
" " "	54	6	·870	"
Oak, red (Quercus rubra)—U. S.	32	2	·514	
Oak, black (Quer. tinctoria)—U. S.	34	14	·558	
Oak, live (Quercus virens)—U. S.	56	4	·900	Heaviest and hardest of the oaks
" " "	51	11	·827	
Pawpaw (Uvaria triloba)—U. S.	22	7	·359	
Persimon (Diospyrus virginiana)—U. S.	44	6	·710	Hard, close-grained
Pine, yellow (Pinus mitis)	23	8	·376	Carpentry work
Pine, Amer. yellow "	22	15	·367	"
Pine, red (Pinus resinosa)—U. S.	28	7	·455	Carpentry; strong
Pine, Amer. red "	26	11	·427	Carpentry
Pine, pitch (Pinus rigida)—South Carolina	32	0	·512	Strong and durable
" "	42	2	·674	Much used in shipbuilding
Pine, Virginia "	34	6	·550	
Pine ?—Upper Canada	22	8	·360	Same purposes as common deal
Poplar, yell'w (Liriodendron tulipifera)—U. S.	24	3	·387	
Poplar (Populus ——?)—U. C.	20	11	·331	
" " "	19	4	·318	Light, inferior wood
Red bud, *see* Judas tree				
Sassafras (officinale)—U. S.	37	4	·596	From a young tree
Spruce, white (Abies alba)	23	13	·381	
Sycamore, *see* Button wood				
Tamarac (Larix americana)—U. C.	23	15	·383	Good for shipbuilding purposes
Treenail (Robinia pseud-acacia)—U. C.	41	8	·664	Treenails for shipbuilding
Walnut, white—U. S.	30	5	·485	From a young tree
Walnut, black (Juglans nigra)—U. S.	28	15	·463	Strong, tough, not liable to split
" " Upper Canada	28	11	·459	

The foregoing list contains a very imperfect enumeration of Canadian woods; it will serve, however, as a beginning of what may be made an exceedingly interesting and highly important kind of information, and easily susceptible of considerable extension, if the Canadian Institute can succeed in collecting, through its members, an assortment of woods, to be deposited in the museum in progress of formation, with duplicate specimens for contribution to the Sydenham Crystal Palace, where the British public may be made familiar with the numerous and extensive, but comparatively little known, treasures of our forests.

Remarks on Thermometric Registers; by Captain J. H. Lefroy, R. A., F. R. S.

(Continued from Page 31.)

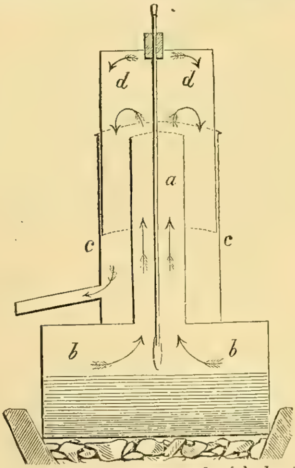
The Committee of the British Association having very recently announced its readiness to supply true standard Thermometers to members of that body and others, at a low rate, it may be hoped that these instruments will soon be found in the apartments of Scientific and Literary Societies in Canada: § it may be desirable therefore to refer somewhat more fully to their verification, than was done in the previous part of this article.

(1.) To determine the zero point, if the thermometer is one with an arbitrary scale, or verify it, if it is graduated to Fahrenheit.

Fill a quart measure or similar vessel, with ice that has been pounded fine in a bag or cloth, the finer and more uniform the better. Add a little water, immerse the thermometer, standing upright, in this, up to the point 32° on the scale, and after allowing it a little time to settle, read the scale to the nearest tenth of a division: take several readings, with an interval of a minute or two between them, and note them all in the register, whether they vary or not. The observation cannot be made very accurately in the summer, and the nearer the temperature of the air in the room at the time is to 32° Fahr. the better.

(2.) To determine the boiling point on the scale of the thermometer.

Get any tinsmith to make a vessel for generating steam, after the drawing given below. It consists of a boiler holding about



half a gallon, (*b*) to which is added a tube (*a*) about three inches in diameter and ten high; exterior to this, but not communicat-

§ Regulation of Council.—That Standard Thermometers made at Kew, be supplied on application to members of the British Association, and Fellows of the Royal Society, at £1 stg. each. Report, &c., Belfast Meeting, September, 1852.

ing with the boiler, is a second tube (c) of the same height, but large enough to have a space of an inch or more clear between the two, at the bottom of this outer tube is a small pipe for the escape of the steam; it may be three-quarters of an inch in diameter at the orifice. Lastly, a cap tube (d) closed at top, is made to fit the exterior tube, and slide upon it tightly enough to stand at any height at which it may be set. In the centre of the top of this latter tube is made an orifice large enough to receive a common quart bottle cork, and a short neck soldered on to hold it firmly. The boiler then being half or two-thirds filled with hot rain or snow water, the thermometer is passed through a cork, and slipped down through the orifice just mentioned, until the ball nearly, but not quite, dips in the water, the exterior tin tube being at the same time drawn out so that no more of the tube of the thermometer is above the cork than is absolutely necessary. The apparatus is then set over a braizer's furnace or something of the same nature, until the water boils briskly and the steam by degrees expels the whole of the air, and escapes freely by the pipe left for the purpose. If the size of this escape pipe is properly proportioned, which does not appear to be a matter of much nicety, the vessel will now be filled with steam of an elasticity precisely represented by the Barometric pressure at the moment; and the mercury in the thermometer, rising just above the cork, will stand at the boiling point. It is desirable to ascertain whether the escape tube is rightly proportioned by partially stopping it; if two or three such alterations of its size have no visible effect upon the reading of the thermometer, we may be satisfied. In finished instruments a mercurial syphon guage is attached.

The following table, calculated by M. Regneault, contains the true temperature of steam, of elasticity corresponding to the barometric pressures annexed; in other words, the temperature which should be indicated by a thermometer plunged in the steam of such a vessel as is described above, when the elasticity of such steam, (measured by the exterior Barometer) is equal to the pressure stated. The English equivalents of the French measures are given for convenience.

TEMPER'TURE.		PRESSURE.		Diff.	TEMPER'TURE.		PRESSURE.		Diff.
Cent.	Fahr.	Millim	Inches.	Inch.	Cent.	Fahr.	Millim	Inches.	Inch.
°	°				°	°			
99.0	210.20	733.21	28.8671		100.0	212.00	760.00	29.9218	
99.1	210.38	735.85	28.9710	.1039	100.1	212.18	762.73	30.0293	.1075
99.2	210.56	738.50	29.0753	.1043	100.2	212.36	765.46	30.1367	.1074
99.3	210.74	741.16	29.1798	.1045	100.3	212.54	768.20	30.2447	.1080
99.4	210.92	743.83	29.2846	.1048	100.4	212.72	770.95	30.3529	.1082
99.5	211.10	746.50	29.3903	.1057	100.5	212.90	773.71	30.4615	.1037
99.6	211.28	749.18	29.4956	.1061	100.6	213.08	776.48	30.5705	.1090
99.7	211.46	751.87	29.6017	.1061	100.7	213.26	779.26	30.6800	.1095
99.8	211.64	754.57	29.7080	.1063	100.8	213.44	782.04	30.7894	.1094
99.9	211.82	757.28	29.8147	.1067	100.9	213.62	784.83	30.8994	.1100
100.0	212.00	760.00	29.9218	.1071	101.0	213.80	787.63	81.1096	.1102

Suppose then that the mean of several readings of the thermometer over the boiling water is 211°.50; the Barometer, reduced to 32°, giving a pressure of 29.826 at the time. The temperature of steam, of elasticity equal to 29.826, we see by the above table, falls between 211°.82 and 212°.00: it will be precisely 211°.84, which is, therefore, the true temperature, and the thermometers reads 0°.34 too low: this is not, however, the true *boiling point*, the pressure being less than the standard pressure; the reduction is—

$$0.18+\tfrac{096}{407}=0.16$$

The true boiling point upon this thermometer, is, therefore, 211°.66 instead of 212°, showing, as before, an error of graduation of —0°.34. As one-tenth of a degree is a very sensible quantity in the scale of these thermometers, and the perfect fixity of the mercury in the steam, as long as the pressure remains the same, enables an observation to be made with great precision: the above apparatus can be employed for determining differences of level, upon occasion—allowing 511 feet for the first degree, 513 feet for the second, 515 feet for the third—from 212° downwards: but the observer must be careful in this climate to choose very settled weather for the purpose, or a change of the Barometer may introduce an error larger than the quantity to be measured.

The freezing and the boiling points of the standard thermometer should be verified occasionally, and all other thermometers carefully compared with it, at several points on the scale. So little have even the best instruments of the best makers, heretofore justified in all cases, their title, or their cost, that instances have been recently adduced of the Standard Thermometers of more than one Observatory, being a degree or two in error at the extremes of their scales. That of Toronto was found to be 1°.8 too high at —10°, that of Makerstoun to be 0°.97 too high at 90°, it cannot be therefore too strongly insisted on at the outset of Meteorological Observations, that the accuracy of the instrument demands the first care.

II. *Position of Thermometers.*—The object of the register being to obtain the true temperature of the air of the locality; the thermometer must be guarded, first, from influences which affect the instrument more than they affect the air; its power of radiation and absorption being greater; secondly, from causes which make the air in which it is immersed, an unsuitable example of the temperature of the neighbourhood. As when, for example, it is placed in a narrow court yard, with buildings sometimes reflecting heat, sometimes evaporating moisture, all round it. It should be placed on the north side of a building to avoid reflected heat; but where there is a free circulation of air, otherwise such a situation is apt to be damper, and therefore colder than is natural: at the same time it should itself be secured from wind. It should be detached six inches *at least*, from the wall or other support, and fixed, not hung, upon a bracket. The almost universal practice of English observers is to place the bulb at four feet above the ground. The official instructions to the observers in Prussia, (Regent's Reports, 1850,) direct, however, the height to be not less than twelve or fifteen feet,—a first floor window is therefore not inadmissible, and has indeed been selected in several instances, where local circumstances made it convenient, by the able superintendent of the State Meteorological Observations of New York and Massachusetts, Professor Guyot. The decrease of mean temperature, as we ascend, being only one degree for 280 feet or thereabouts, a difference of ten or twelve feet would be entirely insignificant, were it not that the air within a few feet of the ground is warmed by day and cooled by night, by causes which vary sensibly within that range. Thus a thermometer fully exposed to the sky, at *one* foot above long grass, was found by Mr. Glaisher in his elaborate experiments on radiation, (Phil. trans. 1847,) to read at night 1°.68 *lower* than it would have done, but for the abstraction of heat, by the grass, from the air in contact with it, to compensate for its own loss of heat by radiation into space.

At two feet, it read 1.32 lower,
four " " 1.18 lower,
six " " 1.03 lower,
eight " " 0.73 lower,

than the standard, and he was led to the important conclusion, that "if a thermometer be freely suspended in the air with its bulb at the height of thirteen feet above the soil, and far from any object to reflect heat to it, its readings will represent the true temperature of the air at the time, and much more truly than those of any one placed near the ground, or within a few feet of walls or buildings." The thermometer in this situation is not supposed to be protected from the sun or from rain. It has also

been shown by the same experiments that a thermometer radiates its heat into space at the rate of one-tenth of a degree for every tenth of unclouded sky visible from the bulb. Other experiments have established the law that the cooling of bodies by radiation at night, is always in the same proportion to the clearness of the sky, whatever be the actual temperature. Hence a thermometer should be so placed that no portion of the sky shall be visible from the bulb: that it must be screened from rain is self-evident, and the same arrangement will fulfil both purposes, but it is not necessary for the former of them that the covering should be of a substantial nature, the very thinnest substance that can be interposed being sufficient to arrest entirely the radiation of heat into space.

Such, then, being the principles upon which the place of a thermometer should be determined, it will be acknowledged that a great proportion of those consulted for private information, whatever else they may indicate, do not indicate the true temperature of the air, in the sense understood by Meteorologists: and hence a large proportion of the discrepancies and anomalies which make the collation of any collection of observations so discouraging a task. For example, in some observations made at Quebec—1828–1836—(*Trans. Hist. Soc., Vol. III,*) we find a sudden fall of two and a half degrees in the mean annual temperature for the latter half of the series.

Mean Temper. 9 A. M.	°	Mean Temper. 9 A. M.	°
—	—	1832	35.87
1828	37.90	1833	35.85
1829	37.81	1834	35.98
1830	38 24	1835	35.06
1831	38.43	1836	34.83
Mean	38.09	Mean	35.52

This must have been caused by some change of the Instrument, or of its exposure, but no explanation is given of the circumstances. In a similar manner the mean temperature at Ancaster, C.W., rose three or four degrees in 1839, according to the observations of Dr. Craigie, published in *Hall's Medical Journal*, 1846, and which are, in other respects, deserving of every confidence.

Mean Temper. 9 A. M.	°	Mean Temper. 9 A. M.	°
—	—	1839	47.59
—	—	1840	47.94
—	—	1841	47.66
1835	44.09	1842	47.22
1836	43.41	1843	45.80
1837	43.45	1844	48.18
1838	44.75	1845	48.33
Mean	44.17	Mean	47.53

The difference in this case is equivalent to a change in geographical position of about 150 miles, or to a removal from Ancaster to Ohio. Errors of position generally affect the final result with their full weight—errors of graduation sometimes balance one another upon the whole; it is, therefore, of great importance that the former be reduced, by attention to all the circumstances indicated. Practically, a box with lattice sides, not too contracted, excluding rain and sun, but allowing free circulation of air, while it checks the force of the wind, will generally answer, but the observer must exercise his own judgment as to whether heat is reflected into this box from the wall or window it faces, and place it so as to render that effect, which is appreciable from a considerable distance, almost impossible.

The following table contains the *horary corrections* to observations of the thermometer in Canada, or the corrections necessary to reduce the mean temperature, derived from observations at certain incomplete hours of the day, to *true means.* They are derived from the seven years of hourly observations at Toronto:

	5 A. M.	6 A. M	7 A. M.	8 A. M.	9 A. M.	10 A.M	11 A.M.	Noon.	1 P. M.	2 P. M.	3 P. M.	4 P. M.	8 P. M.	9 P. M.	10 P. M.	11 P. M.	Midn.
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	+2.46	+1.83	+1.94	+ .66	+0.63	—0.59	—1.70	—2.48	—2.92	—3.20	—3.16	—2.63	—0.12	+0.07	+0.44	+0.77	+1.47
February	+3.62	+4.23	+4.34	+3.29	+1.02	—0.95	—2.44	—3.56	—4 49	—4.88	—4.90	—4.47	—0.13	+0.52	+1.06	+1.60	+1.73
March	+1.35	+4.75	+3.93	+1.89	—0.25	—1.91	—3.14	—4.15	—4.79	—5.31	—5.15	—4.65	+0.03	+1.00	+1.63	+2.01	+2.63
April	+5.75	+5 48	+3.22	+1.09	—1.01	—2.45	—3.85	—4.86	—5 72	—6.14	—6.16	—5.81	+0.66	+1.78	+2 59	+3.07	+3.22
May	+7 83	+5.40	+2.43	+0.06	—2 11	—3.81	—4.92	—5.87	—6.83	—7.13	—7.20	—7.17	+0.43	+2.31	+3.29	+4.20	+5.02
June	+7.88	+5.21	+2.41	+0.10	—1.82	—3.49	—4.77	—5 88	—6 59	—7.03	—7.37	—7.60	+0.33	+2.44	+3.80	+4.76	+5.15
July	+9 02	+5 92	+2.38	—0.31	—2.39	—3.98	—5.49	—6.72	—7.58	—8.26	—8.34	—8.25	+0.68	+2.99	+4 24	+5.21	+6.37
August	+7.89	+6 57	+3.28	+0.21	—2.26	—4.18	—5 57	—6.39	—7.11	—7.62	—7.98	—7.79	+1.23	+2.70	+3.73	+4.54	+5.33
September	+6 77	+6.17	+3.68	+ .02	—1.52	—3.47	—4.85	—5.95	—6.58	—6.96	—7.01	—6.75	+0.81	+1.90	+2.94	+3.61	+3.96
October	+4.77	+4.71	+3.94	+1 66	—1.01	—2.93	—1.33	—5 36	—5.76	—6.04	—5.85	—5.17	+0.48	+1.25	+1.97	+2.68	+3.22
November	+2.76	+2.52	+2.52	+1.53	+0 01	—1.41	—2.44	—3.34	—3.74	—3.82	—3 64	—2.83	+0.19	+0.44	+0.78	+1.13	+1:80
December	+2.07	+2.39	+2.55	+2.12	+0.92	—0.53	—1.72	—2.52	—3.06	—3.31	—3.13	—2.47	—0.12	+0.18	+0.47	+0.59	+0.90

It will be seen that, at 8 A. M. in the summer, and at 8 P. M. in the winter, the correction is extremely small. Observations made regularly at those two hours throughout the year, if a greater number are not convenient, will therefore furnish very accurate means, and they are, perhaps, the most convenient hours in the twenty-four. Any three equidistant observations furnish a true mean, such as 6 A. M., 2 P. M. and 10 P. M., or 7 A. M., 3 P. M., 11 P. M.; of these, the first is now generally adopted.

NOTE.—At p. 30, second column, line 25, for 29 992 read 29 922, p. 31, in reference to the freezing mixture of 1 part salt, 2 parts snow, producing a temperature of —4°, or as some authorities give it —5°, it should have been added, that *equal* weights of snow and salt reduce to 0 0, or zero: both mixtures should be tried if possible.

Gas Patents, by Henry Croft, D. C. L., Professor of Chemistry in the University of Toronto.—(*Continued.*)

The principal object intended to be effected by the various contrivances already mentioned, as applied to the purification of gas, is the separation of the two gases carbonic acid and sulphuretted hydrogen; the former, not being combustible, does not in any way contribute to, but rather diminishes the brilliancy of the gas, while the latter is objectionable, inasmuch as the light which it gives out during burning is very feeble, a suffocating compound (sulphurous acid) is formed during the combustion, and moreover, it possesses a disagreeable smell and poisonous properties. In the older plans the ammonia was not separated, only lime purifiers being used, but it was absorbed by the water in the gasometer; its economic value is now so great, that as before described, it is separated by a special apparatus.

Besides these substances which are thus removed from the gaseous mixture, there are several other bodies which are deposited either in the hydraulic main, in the coolers, or in the purifiers, and which of themselves possess very great illuminating power, from containing a large proportion of carbon. These bodies will burn with a brighter flame than even pure olefiant gas, and it would therefore appear that the processes of cooling and purifying have had the effect of diminishing the excellence of the gas

by removing these so-called hydrocarbons from the mixture.

In 1826, Faraday discovered various compounds of this nature in the liquid obtained by compressing oil gas, and among others a substance which was afterwards formed by Mitscherlich from the decomposition of benzoic acid, viz., benzine. This substance was proved by Hoffmann to be present (mixed with a variety of bodies of a similar nature) in common naptha or coal tar oil, which is obtained in large quantities during the distillation of tar, and it has lately been obtained from that source in large quantities by Mansfield. This body possesses in an eminent degree the illuminating power when burnt in a good draught, and as it is a very volatile substance, it would be better fitted for "napthalizing" the gas than any of the other hydrocarbons with which it is associated. On account of economy, however, the rectified coal tar oil is used without further purification. The process of napthalizing consists simply in saturating the purified coal gas with the vapours of some of those substances from which it had been freed in a previous part of the process, and this is effected either by filling the meter by which the gas is measured with the naptha, or by passing it through a kind of closet containing shelves, on which are placed pieces of sponge or of pumice stone soaked in that liquid. In one contrivance the gas is freed from ammonia by passing over pumice stone soaked in sulphuric acid, contained in one-half of the apparatus, and is then *napthalized* by being carried through the other half filled with sponge or pumice stone saturated with coal tar oil.

An application of this napthalizing process has been made in a plan for preparing gas, which has attracted a good deal of attention in the States of late years; viz., Paine's process for preparing gas fitted for illumination from water. Paine claims to have discovered a method by means of a magneto-electric machine, of converting water *entirely* into oxygen or hydrogen by merely changing the electrical poles. No one would have been astonished if such a statement had been made in the times of Geber or Albertus Magnus, but that the possibility of such a conversion of elements should for one moment be entertained at the present day, seems rather curious. The water having by this incredible process been converted into hydrogen, a gas which gives out little or no light in burning, is then endowed with illuminating powers by a process little less incredible. The gas is passed through oil of turpentine and becomes, as Paine says, *catalized*, the applicability of which term, derived from a Greek word, signifying to loosen or dissolve, seems more than doubtful. By this process, *without taking up any turpentine, although it acquires its smell*, the gas is said to become capable of emitting a powerful light on combustion. According to the best information that we as yet possess on the subject, the whole invention may be designated as humbug.

Another plan in which water is employed is more feasible, viz., that invented by Gilliard, which depends upon the intense light emitted by platinum rendered incandescent in the flame of hydrogen.

The hydrogen is obtained by passing the vapour of water over heated coke, by which means a mixture of hydrogen, carbonic acid, carbonic oxide, with a small trace of carburetted hydrogen, is produced. By the ordinary lime purifiers it is freed from carbonic acid, and is burnt in jets, over which are suspended cages of platinum wire. There can be no doubt of the brilliancy of the light emitted, but the safety of the process seems somewhat doubtful, when we consider the explosive qualities of hydrogen when mixed with air, and the remarkable ease and rapidity with which this gas escapes through the finest crevices, and when under pressure through tissues, which to other gases are totally impervious. This gas has also been applied to heating metallic plates placed in a grate so as to replace burning coals, and apparently with some success.

In the former paper a plan was mentioned by which water was resolved into its elements by passing through one-half of a retort filled with incandescent coke, and a modification of this process seems to be that adopted at the Astor House in New York, and alluded to in the Annual of Scientific Discovery for 1851. It is clear that the process is incorrectly described in that work, but it seems to consist of a combination of the water-decomposing process by means of hot coke, and the production of ordinary gas by the destructive distillation of melted rosin.

Various substances of a nature similar to rosin, such as asphalt-bituminous slate, oils, fats, &c.. have been employed at times for the preparation of gas, but although each may be more particularly applicable in certain localities and under peculiar circumstances, yet, as a general means of preparing gas they cannot compete with coal.

Since writing the first part of this paper I have found that a process for making gas from wood has been invented by Pettenhofer, and is being extensively employed in various parts of Germany

The gases evolved from the destructive destillation of any animal or vegetable substance will always be essentially the same, differing in the relative proportions of the gases, and in those compounds which are formed in small quantities during the process, and are either mixed with the gas or deposited with the tar. The general process for purifying and collecting remains the same as above described.

A few words might be said in reference to the uses of the different substances produced during the formation of gas, as some which were formerly considered as useless have lately been proved to be of considerable value.

The coke which remains behind is exceedingly valuable as a fuel, from the fact of its having been deprived of all volatile ingredients, and therefore forming little or no smoke when burnt. In England large quantities of the best cannel coal are coked without collecting the gas for the use of the railroad locomotives.

The tar is frequently returned into the retorts or else employed in keeping up the fire, the coking furnaces mentioned in the last paragraph are sometimes fed by means of it. When distilled it yields a residue of pitch and a volatile liquid called naptha, from its resemblance to mineral naptha. This substance is a mixture of a variety of interesting chemical compounds, and is applied to several useful purposes in the arts; such as the solution of caoutchouc and gutta percha. The gas liquor, which is the aqueous portion of the contents of the hydraulic main, contains a variety of compounds, and possesses a most disagreeable odour, it was formerly thrown away, and often allowed to run into rivers to the destruction of fish and the entire deterioration of the water for domestic purposes. Even at the present day this nuisance exists to a certain extent in London. The greater portion of it, however, is employed in the manufacture of sal ammoniac. The gas liquor of itself contains a considerable quantity of this salt, but a much larger proportion is obtained by the addition of muriatic acid, evaporation, heating until charring commences, and resolution in water, crystalization or sublimation. Iodine and Bromine have lately been discovered in the gas liquor, and whether these valuable medicinal bodies can be economically obtained from it, remains yet to be proved.

The refuse lime from the purifiers is used for agricultural purposes, and in some instances has been found efficacious in the destruction of the wire worm; it must, however, be employed with caution. By exposing it to the air for some time, a large quantity of a peculiar salt, the hyposulphite of lime, is generated, from which may be prepared the corresponding compound of soda, a substance which finds rather an extensive use in Photography and the preparation of Daguerreotypes.

The separation of ammonia from the gaseous mixture has been already described.

Hints to the beginner in Water Colour.

A Landscape is divided into three parts, distance, middle and foreground, one-fourth for light, one-fourth for shadow, and half for middle tint, or medium between light and darkness.

Azure distances require autumnal tinted foliage, between Sienna and Gamboge.

Trees most green at prominent parts, grey at top and sides.

If a tree is required on a blue sky, let it be yellower than otherwise.

If dark foliage on yellow ground, bluer.

The sky near the zenith blue, but paler as it nears the horizon.

The general shade tint, Indigo and Indian red, the general glazing yellow-ochre and lake.

Vivid blues, reds, greens, and yellows used sparingly.

Highest lights not profusely scattered over the picture.

The principal object to be placed in the best possible view.

The effect is bad when the parts are many.

Warm effect of colours, white, yellow, orange, red, purple and black.

Cold effect of colours, black, dark blue, blue, green, yellow pale yellow and white.

In general warm colours must predominate; red is medium in a warm effect, green a medium between light and dark.

Cold tints are made with blue and yellow, blue, and warm tints with yellow and red.

Greys are warm as they contain orange, cold as they contain purple or green.

Pure tones are those that approach purple, heavy as they near to green. Avoid greenish blues and yellows; and green, between blue and yellow that they produce.

Red becomes more rich as it tends to blue—brilliant as it advances to yellow.

Purple and orange are pleasant in all their tints, but green only as it becomes yellow.

Indian red, indigo and yellow-ochre are the primitives for mixing, the following being produced by their combinations:—

Orange	by	Yellow	and	Red.
Green	"	Yellow	"	Blue,
Purple	"	Red	"	Blue,
Brown	"	Orange	"	Purple,
Olive	"	Green	"	Orange,
Slate	"	Green	"	Purple,
Black	"	Olive	"	Brown and Slate,
White	"	Black diluted to the highest tint.		

Colours most vivid by contrast:

Yellow	when	opposed	by Purple,
Red	"	"	" Green,
Blue	"	"	" Orange,
Dark Orange	"	"	" Warm Green,
Red Brown	"	"	" Dark Green,
Red Purple	"	"	" Yellow Green,
Dark Purple	"	"	" Warm Brown.

The opposite of either primitive is made by the other two.

Plants and Botanists.*

The beginning of a creature, whether animal or vegetable, is a mystery seemingly unfathomable. Nevertheless, continued microscopic research is gradually revealing indications, dim yet not uncertain, of the phenomena that are grouped around the genesis of the germ. Every new fact brought to light through the laborious perseverance of indefatigable observers, raises more and more our astonishment at the mingled simplicity and complexity of procreating nature. Within the last ten, or rather within five years, great advances have been made in the study of embryology. German botanists have especially chosen this line of research, and their endeavours have been rewarded with no small amount of success. The scientific naturalist, to whom their writings, mostly in the form of scattered memoirs and short papers may be inaccessible, will find an excellent digest of the results arrived at in two very able reports by Mr. Henfrey, a young English botanist, who is earning well-deserved laurels by his zealous labours in this difficult department. It is not easy to make clear to the general reader the particulars of such inquiries, although the conclusions which have been induced from them are of remarkable interest. We shall endeavour, nevertheless, to present, in plain and untechnical shape, one of these curious histories, and tell the story of the beginning of a pine-tree, for the benefit of lovers of Nature, whose time and tastes are so employed as to prevent their seeking personally for these flower-born truths.

Plants that have distinct and unmistakeable flowers produce their eggs (ovules) either within a nursery-cradle (ovary or germen,) constituted out of metamorphosed leaves, or unprotected and exposed—foundling fashion. Among the latter are firs, pines, cedars, junipers, yews, cypresses, and similar cone-bearing trees; these cones being whorls of scale-like leaves arranged to serve as screens to the little eggs that are the essence of the cone, or else to the little anthers that originate the potent dust or "pollen," which is destined to fertilize the eggs and convert them into seeds. The grains of pollen-dust, though microscopic in their dimensions, are by no means simple in their structure, for their is, as it were, organ within organ, included within their diminutive frames. Each consists of an outer coat and an inner one, the latter endowed with a marvellous ability of growth and extension; elongating, when set free, its filmy membrane into delicate tubes that grow with magical quickness, and transmit through their cavities the still minuter vivifying particles that live within them. The poet sings a libel when he makes his talking tree

> " *Languidly* adjust,
> It vapid vegetable loves
> With anthers and with dust."

Not until the pollen grain has fallen upon the ovule (in anglospermous plants upon the stigma or viscid disc that crowns the ovary) does the embryo of the future plant begin in any way to be manifested. The former event may be said invariably to precede the latter, the relation between them being one of cause and effect. The anomalies, are obscure and exceedingly few, so that they cannot be accepted as objections to this rule. So far we are repeating what every youth, acquainted with the rudiments of botany, knows. This knowledge was the starting point for those who would investigate the mystery.

The egg of the pine is an assemblage of minute cells forming a kernel enveloped in a single cellular coat. Deep in its substance is a row of cells that combine to make a special sac or cavity. When the grains of pollen have fallen upon the egg they burst, and their inner linings protrude in the shape of tubes, and penetrate its substance. Soon after, the sac that lies within it becomes filled up with new-born cells. A year rolls away in

* Westminster Review—October.

the life of the parent tree; the cells of various kinds—those external to the central sac and those of its interior—have multiplied abundantly, and enlarged their several dimensions. The sac itself has become twenty times as large as it was formerly, and is filled with lesser cells, among which a change commences. Certain of them (the number varying in different tribes) grow larger than the others, and those that are between their larger cells (corpuscles) and the wall of the containing sac divide themselves each into four by transverse vertical partitions. The purpose of this division is the construction of an avenue of approach, guarded by four new cells, and leading into the greater cell or corpuscle that lies below.

All this cell-making, and changing, and re-arranging, is preparatory to the inauguration of the germ of the future pine-tree. But other changes must be effected before that germ can begin. In the cavity of each corpuscle new free cells are produced, among which one—the lowermost—has a special mission of its own. After the pollen tubes have forced their way, guided by unerring instinct, through the substance of the egg-mass, through the wall of the included sac, and through the canal formed by the four cells that separate each corpuscle from that wall, this one begins to enlarge. *Against* the membrane of the corpuscle itself the extremity of the pollen-tube lies. It is then that the lowermost of the new-born cells within the corpuscle begins to grow and to produce within itself a new generation of cells, commencing with a free cell that divides itself into two; these re-dividing, make four, from which, by a fresh operation of division, result eight. Of these eight, the four lower ones divide again, until, by force of pressure, the mother-cell is burst, and its matricidal progeny, combined among themselves, lodge in the dissolving membrane of the egg-mass.

This is the beginning of the end. The mass of cells thus lodged has a four-fold constitution, being made up of four rows that separate from each other like so many filaments. And now the end is in view. For the lowermost cell of each of these filaments (suspensors) becomes, by a new process of division and multiplication, the embryo, the germ of the future pine-tree.

But Nature, after an intricate and seemingly tiresome series of proceedings, having at length given birth to the germ—there being as many stages in its manufacture as in a complicated machinery process devised by inventive man for some very simple though profitable result—is not content with her labours of multiplication and germ creation. No sooner is the beginning of the new being perfected, than a work of fearful destruction commences.

Four times as many germ-plants have been produced as there were "corpuscles" in the sac within the egg. For each of the cells so styled has resulted in giving origin to a body that has divided into four sections, and each of its four filamentous segments has developed a true germ at its extremity. In some of the pines there are as many as five corpuscles formed in every egg-mass; in some of the junipers, as many as eight of these bodies. The result of the fertilization of the egg is, therefore, the production in the former of as many as twenty pine-germs—in the latter, of as many as thirty incipient junipers. But the world is not destined to have the benefit of these baby plantations. Out of the twenty germs in the pine-eggs, and the thirty in the juniper egg, only one, in each case, is intended to survive. One favoured infant, although as yet a microscopic embryo, is nurtured and reared at the expense of all its brethren. That tyrant one arrests their growth, and pushes them rudely aside. They waste away, and soon cease to exist: the chosen one only has a chance of growing up into a tree.

Such are the lately announced fruits of the minute researches of Hofmeister, a German botanist, who has worthily following in the wake of Robert Brown. The complexity of the changes, the simplicity of the operations and organs by which they are brought about, and the strangeness of the result, leave an impression of amazement on the mind of the botanist, knowing, as he does, that in many plants, yet higher in the scale of vegetable organization, the process of reproduction is comparatively simple, though sufficiently wonderful and mysterious. By endeavouring to describe these phenomena in unscientific language, we cannot but fail to convey anything like a full sense of their singularity. Our attempt, may, however, serve to show, by example, how wondrous are the minute secrets into which the microscopic observer endeavours, not wholly without success, to penetrate.

And now a word about the investigators of plants.

Of all orders of naturalists, that of botanists is most prolific in individuals. There is scarcely a town of moderate dimensions in Europe which is not the home of one or more votaries of the graceful and gentle science. The same may be said of North America, or, at least, of the United States. Natural history is a religion, and Botany is one of its sects. But, unlike the sects of most religions, there is neither hate nor jealousy between them. The botanist, the zoologist, and the geologist, can all worship side by side, and offer homage to the same Great God, according to their several faiths and forms, without seeking to close the doors of Nature's temple against each other. Botany is a religion of love. It is the life so beautifully defined in the moral of the "Ancient Mariner:"—

> "He liveth best who loveth best
> All things both great and small;
> For the great God who loveth us,
> He made and loveth all."

If moroseness, or viciousness, or indigestion, or envy, (for naturalists being mortals, are afflcted occasionally with these original sins,) will sometimes work in the brains or stomachs of its devotees, and make an occasional delinquent prick the soul of his neighbour with the stiletto of harsh and galling criticism, it is not on account of that neighbour's shade of belief. That, at least, matters not. But though a Schleiden, intellectually athletic, yet ill-regulated in his strength, may delight in his striking out at random,—or a Watson, indefatigable and deservedly illustrious in statistics, but grown misanthrophic by working overmuch when in ill humour, find a melancholy in attributing evil motives to his fellow-labourers—the great congregation of botanists is at peace with itself and friendly with its philosophical neighbours. The wanderer among them who shares in their tastes, needs no introduction, not even the mention of his name, to ensure a welcome. His fame may have spread among the gatherers of flowers in all climates, and he may find his physiognomy framed and glazed, occupying an honourable place among the Lares and Penates of his entertainer—or he may be utterly undistinguished, the author of neither book, nor paper, nor communication, as yet undignified by having genus or even species named after him—famous or obscure, provided that he show proof of the true faith of a botanist—and all who trust in the same creed, will cherish him as the early Christians did a stranger-believer. Let him only exhibit his vasculum and folio, and he will be joyously received, nay, in many instances, find bed and board freely offered. We speak from experience. More than once, in countries where we could ill express our wants in intelligible language, our damp sheets of drying paper spread out on the bench by the inn doors, and our well filled vasculum, have served us in good stead and secured for us hospitable entertainers, workers in the same pleasant field, who now, after a lapse of years, are numbered among our firm and valued friends.

Nor is Botany the science only of a class, even, though, perhaps, on the whole the doctors have the best of it. In its train

are representatives of all ranks and all professions—monarchs and artizans, priests and soldiers. There is one king in Europe who is a good practical botanist, and who must look back upon the hours spent in the arrangement of his fine herbarium with far more pleasure, than upon those wasted in a vain and retrogade course of politics. The monarch in question is His Majesty of Saxony, who, in his scientific career at least, has gained honour and respect. Many is the Story told by his subjects of their ruler's adventures when following his favourite and harmless hobby;—how, more than once, astray from his yawning courtiers, he had wandered in search of some vegetable rarity, across the frontier of his legitimate dominions, and on attempting to return was locked up by his own guards, as a spy or a smuggler, since he could produce no passport, nor give any more probable account of himself than the preposterous assertion that he was their king! Fifteen years ago he made a famous excursion to the stony and piratical little republic of Monte Negro. It was literally a voyage of botanical discovery, and the potentate sailed down the Adriatic in a steamer, fitted out with all the appliances of scientific investigation. On its deck he might be seen busily engaged in laying out his plants, ably and zealously assisted by his equerries and aids-de-camps, and guided by the advice of eminent botanists, who accompanied him as members of his suite. Such a kingly progress had surely never been seen before, unless Alexander the Great may have relieved the monotony of conquering by making occasional natural history excursions with his quondam tutor, Aristotle. The Monte-Negriotes, on ordinary occasions very troublesome and by no means trustyworthy people—folks who still keep many of the worst habits of the old Scottish Highlanders—were mystified into tranquility by the peculiar proceedings of their royal visitor and his noble attendants. Resolved, however, to render due honour to so distinguished and unusual a guest, they furnished a guard of state to accompany him in all his peregrinations, and wherever his botanical Majesty stooped to gather a new or rare species, the soldiers halted, and with much ceremony presented arms!

Were some mighty member of England's over-proud peerage to be told this true tale of kingly amusement, it would probably be received with a smile of mingled pity and scorn, and an expression of compassion for such "sad trifling." Give credit where credit is due, whether to king or caitiff. Which is the real trifler?—the man who, fortunate in having leisure hours and months of vacation, degrades the healthful exercise he seeks by tainting it with the barbarous pleasure of torturing the beasts of the chase and the birds of the moor, multiplied and cherished through a demoralizing system of "preservation," protected by vicious laws:—or he who gains exercise as healthful when seeking to extend his knowledge of the wondrous variety of creation, and to delight his eye and improve his mind by searching out in their native wilds the living evidences of the exquisite beauty and curious workings of Nature?

We may suppose the hypothetical opposite of an absolute king to be embodied in a journeyman tailor. In a diagram constructed like that made by Mr. Owen Jones, for the department of Practical Art, these personages would hold much the same relative places as the "primary red" and "secondary green"—if, indeed, our tailor might not be better paralleled by "tertiary russet." However different in their respective compositions, the pleasant tint of happiness may be given to the lives of both kings and tailors by the same pure ingredient. If royalty grows earnest and simple in the pursuit of herbary, so also can similar tastes make a poor tailor as happy as a king. In a town far north, many years ago, we were present at the anniversary of a Mechanics' Institution, and had to say a few words about flowers and trees. It was well on towards midnight ere the proceedings closed, when a dapper wiry little man rushed out from among the crowd, and invited us, as one naturalist invites another, to visit his humble home, and share his frugal supper. Gladly was the invitation accepted: for the earnest and intellectual look of our evidently poor host excited no small interest and some curiosity. He led his guests through long, dreary, tortuous, and unsavoury alleys, and then up an interminable stair, faintly illumined by the moonlight that seemed to ooze through loopholes. In the story nearest the sky was the home of this student of nature—a journeyman tailor, with a wife and innumerable children, the eldest of whom was a fine intelligent lad, verging upon manhood, assisting the work, and sharing in the tastes of his father. Their favourite studies were manifested by the conversion of an old cupboard into the case of a well-arranged herbarium, by a glazed cabinet filled with stuffed birds and rows of impaled insects, and by a shelf of well-selected scientific books, the purchase of which must have absorbed the profits of many a close day's work. The matron of the family, a smiling, courteous dame, seemed to participate in the evident delight of her husband and first-born, and to take pride in a heartfelt approval of their studies. On the round deal table a clean white cloth was spread, with simple food to grace it; and two pleasant hours were spent in lively discourse, larded with hard scientific names, well understood, though strangely pronounced. The happiness of the whole family was, we believe, visibly increased when, a few weeks afterwards, it became our duty to announce to the head of it, that he had been elected honorary member of a distinguished scientific society.

Who that has read the story of "Mary Barton," does not recollect the admirable picture of the quaint old artisan-naturalist, Job Leigh? There are literally hundreds of such men scattered over the land—and they are a blessing to it. At almost every meeting of the British Association for the Advancement of Science, some worthies of this class may be seen enjoying the happiest day of their lives, by listening to dry and seemingly obstruse discourses in the Natural History section. Most welcome are they when they appear; and there is no more thoroughly hearty welcome, unspoiled by offensive savour of social inequality than that given by philosophers of fame to their brethren of humble worldly position.

> "The nature of flowers Dame Physic doth shew:
> She teacheth them all to make known to a few."

Such was the homely view of botany taken by most of our ancestors, and set into rugged rhymes by quaint old Tusser. The chivalrous Lord Herbert of Cherbury entertained more exalted notions of the fair science, for, writes he in his delightful "Life," "it is a fine study, and worthy of gentleman," who according to his lordship, ought "to know the nature of all plants, being our fellow-creatures, and made for man." We maintain the same position, and humbly submit that even the few instances of the fineness of the study, and its worthiness for gentlemen—our king and our tailor both deserve that often-abused though most honorable of titles—which our space has permitted us to cite, are unassailable evidences of its truth.

Twenty Second Meeting
Of the British Association for the advancement of Science

(Extracts from the President's Address.)

Hitherto the researches of Sidereal Astronomy, even in their widest extension, had manifested the existence of those forces only with which we are familiar in our solar system. The refinements of modern observation and the perfection of theoretical representation had assured us that the orbits in which the double stars, immeasurably distant from us, revolve around each other, are governed by the same laws of molecular attraction which determine the orbits of the planetary bodies of our own system. But

the Nebulæ have revealed to us the probable existence in the yet more distant universe of forces with which we were previously unacquainted. The highest authorities in this most advanced of all the sciences acknowledge themselves unable even to conjecture the nature of the forces which have produced and maintain the diverse, yet obviously systematic, arrangement of the hosts of stars which constitute those few of the Spiral Nebulæ which have been hitherto examined. Hence the importance of increasing our knowledge of the variety of forms in which the phenomena present themselves, by a similar examination of the Southern Heavens to that which Lord Rosse is accomplishing in the Northern Heavens; hence also, we may believe, in great measure the devotion with which his Lordship has directed the unprecedented instrumental power which he has created almost exclusively to the observation of nebulæ. But whilst we cannot but admire the steadiness of purpose with which an object regarded as of paramount importance is undeviatingly pursued, we can scarcely forbear to covet at least an occasional glance at bodies which from their greater proximity have more intimate relations with ourselves, and which, when viewed with so vast an increase of optical power, may afford instruction of the highest value in many branches of physical science. In our own satellite, for example, we have the opportunity of studying the physical conformation and superficial phenomena of a body composed, as we believe mainly at least, of the same materials as those of our own globe, but possessing neither atmosphere nor sea. When we reflect how much of the surface of the earth consists of sedimentary deposits, and consequently how large a portion of the whole field of geological research is occupied with strata which owe their principal characteristics to the ocean in which they were deposited, we cannot but anticipate many instructive lessons which may be furnished by the points of contrast, as well as of resemblance, which the surface of the moon, viewed through Lord Rosse's telescope, may present to the best judgment we are able to form of what the appearance of the earth would be if similarly viewed, or—with what may be more difficult perhaps to imagine—what we may suppose the earth would appear if it could be stript of its sedimentary strata which conceal from us for the most part the traces of that internal action which has played so large a part in moulding the great outlines of the present configuration of its surface. It is understood that Lord Rosse himself participates in the wish that such an examination of the surface of the moon should be made,—and, should the desire of the Association be expressed to that effect, is willing to undertake it in conjunction with one or two other gentlemen possessing the necessary physical and geological knowledge. It will be for the members of the Association to determine the form in which a Report on the 'Physical Features of the Moon compared with those of the Earth' may most appropriately be requested.

The Mathematical and Physical Theories of *Light* have afforded subjects for many interesting and profitable discussions in Section A, and have usually had one day in the six specially allotted to them. Those discussions will derive a more than usual interest at this meeting from the remarkable discovery recently made by Prof. Stokes, that under certain circumstances a change is effected in the refrangibility of light,—and from the advantage we possess in having amongst us on this occasion the eminent mathematician and physicist by whom this most important contribution to the science of physical optics has been made. His researches took their origin from an unexplained phenomenon discovered by Sir John Herschel, and communicated by him to the Royal Society in 1845. A solution of sulphate of quinine examined by transmitted light, and held between the eye and the light, or between the eye and a white object, appears almost as transparent and colourless as water; but when viewed in certain aspects and under certain incidences of light, exhibits an extremely vivid and beautiful celestial blue colour. This colour was shown by Sir John Herschel to result from the action of the strata which the light first penetrates on entering the liquid; and the dispersion of light producing it was named by him epipolic dispersion, from the circumstance that it takes place near the surface by which the light enters. A beam of light having passed through the solution was to all appearance the same as before its entrance; nevertheless, it was found to have undergone some mysterious modification,—for an epipolized beam of light—meaning thereby a beam which had once been transmitted through a quiniferous solution, and had experienced its dispersive action—is incapable of further epipolic dispersion. In speculating on the possible nature of epipolized light, Prof. Stokes was led to conclude that it could only be light which had been deprived of certain invisible rays which in the process of dispersion had changed their refrangibility and had thereby become visible. The truth of this supposition, novel and surprising as it at first appeared, has been confirmed by a series of simple and perfectly decisive experiments; showing that it is in fact the chemical rays of the spectrum, more refrangible than the violet, and invisible in themselves, which produce the blue superficial light in the quiniferous solution. Prof. Stokes has traced this principle through a great range of analogous phenomena, including those noticed by Sir David Brewster in his papers on "Internal Dispersion;" and has distinguished between "cases of false internal dispersion" or "opalescence," in which the luminous rays are simply reflected from fine particles held in mechanical solution in the medium, and those of "true internal dispersion," or "fluorescence," as it is termed by Prof. Stokes. By suitable methods of observation the change of refrangibility was detected, as produced not only by transparent fluids and solids, but also by opaque substances; and the class of media exhibiting "fluorescence" was found to be very large, consisting chiefly of organic substances, but comprehending, though more rarely, some mineral bodies. The direct application of the fact, as we now understand it, to many highly interesting and important purposes, is obvious almost on the first announcement. The facility with which the highly refrangible invisible rays of the spectrum may be rendered visible by being passed through a solution of sulphate of quinine or other sensitive media, affords peculiar advantages for the study of those rays; the fixed lines of the invisible part of the solar spectrum may now be exhibited to our view at pleasure. The constancy with which a particular mode of changing the refrangibility of light attaches to a particular substance, exhibiting itself independently of the admixture of other substances, supplies a new method of analysis for organic compounds which may prove valuable in organic chemistry. These and other applications of the facts as they are now explained to us, will probably form subjects of notice in the Chemical and Physical Sections; and a still higher interest may be expected from the discussion of the principle itself, and of the foundation on which it rests. A discovery of this nature cannot be otherwise than extremely fertile in consequences, whether of direct application, or by giving rise to suggestions branching out more and more widely, and leading to trains of thought and experiment which may confer additional value on the original discovery by rendering it but the first step in a still more extensive generalization.

Among the subjects of chemical inquiry which may well deserve the attention of a combination of philosophers, perhaps few could more usefully occupy their joint labours than the revision of the Equivalent Numbers of the Elementary Bodies. This is a task which must necessarily require the co-operation of several properly qualified individuals, if it be accomplished in anything like a reasonable period of time. Most of the Numbers now in use depend upon experiments performed by Berzelius, at a time when the methods of research then known were inadequate, even in such hands, to determine these constants with an accuracy sufficient for the wants of science at the present day. So much has this been felt to be the case, that many of the most accomplished

chemists now living have undertaken extensive and laborious, though isolated researches upon the combining quantities of some of the most important elements. But much more than has been already performed still remains undone. Such a subject, it is believed, might be highly proper for consideration by the Chemical Section; to whose notice it would be introduced by the distinguished chemist, Dr. Andrews, who presides over that Section,—and than whom no one could be named as more competent to estimate the importance of such a revision, or to judge more truly of the qualifications that would be required for its execution.

The theory of Heat has made great advances within the last ten years. Mr. Joule has by his experiments confirmed and illustrated the views demonstrated about the end of the last century by Davy and Rumford regarding the nature of heat, which are now beginning to find general acceptance. He has determined with much accuracy the numerical relation between quantities of heat and mechanical work. He has pointed out the true principles upon which the mechanical value of any chemical change is to be estimated, and by very careful experiments he has arrived at numerous expressions for the mechanical equivalents in some of the most important cases of chemical action in galvanic batteries, and in combustion. These researches appear to be laying the ground-work for the ultimate formation of a *Mechanical Theory of Chemistry*, by ascertaining experimentally the mechanical equivalents expressed in absolute motive force of the thermic, electric, and magnetic forces.

In connexion with the subject of heat, I would advert to the experiments in which Mr. Hopkins is engaged for investigating the possible influence of high pressure on the temperature at which substances in a state of fusion solidify—an inquiry which was shown by Mr. Hopkins, in a report recently presented to the British Association, to have an important bearing on the questions of the original and present state of the interior of the earth. It is well known that the temperature of the earth increases as we descend, and it has been calculated that at the rate at which the increase takes place in such depths as are accessible to us, the heat at a depth of 80 or 100 miles would be such as to fuse most of the materials which form the solid crust of the globe. On the hypothesis of original fluidity, and assuming that the rate of increase known to us by observation continues farther down, and is not counterbalanced by a considerable increase in the temperature of fusion occasioned by pressure, the present state of the earth would be that of a solid crust of 80 or 100 miles in thickness enveloping a fluid nucleus. Mr. Hopkins considers this state to be inconsistent with the observed amount of the precession of the equinoxes, and infers that if the temperature of fusion be not increased considerably by pressure, the hypothesis of internal high temperature being due to primitive heat cannot be correct; whilst, on the other hand, if the temperature of fusion be considerably heightened by pressure, he considers the conclusion to be unavoidable, that the earth must be solid at the centre.

Mr. Hopkins is assisted in these experiments, which are carried on at Manchester, by the well-known engineering knowledge of Mr. Fairbairn, and the equally well-known experimental skill of Mr. Joule The principal difficulties attending the experiments with substances of low temperatures of fusion have been overcome, and strong hopes are entertained of success with substances of more difficult fusibility. The pressures employed are from three to four tons to eight and ten tons on the square inch. The latter is probably equal to the pressure at several miles beneath the earth's surface.

From *Heat* the transition is easy, and by many may be deemed natural, to *Terrestrial Magnetism*,—a science which perhaps more than any other has profited by the impulse and systematic direction communicated to it by the British Association, and which perhaps more than any other required such external aid.

We recognize in terrestrial magnetism the existence of a power present everywhere at the surface of our globe, and producing everywhere effects indicative of a systematic action; but of the nature of this power, the character of its laws, and its economy in creation, we have as yet scarcely any knowledge. The apparent complexity of the phenomena at their first aspect may reasonably be ascribed to our ignorance of their laws, which we shall doubtless find, as we advance in knowledge, to possess the same remarkable character of simplicity which calls forth our admiration in the laws of molecular attraction. It has been frequently surmised,—and the anticipation is, I believe, a strictly philosophical one,—that a power which, so far as we have the means of judging, prevails everywhere in our own planet, may also prevail in other bodies of our system, and might become sensible to us—in the case of the sun and moon particularly—by small perturbing influences measurable by our instruments, and indicating their respective sources by their periods and their epochs. As yet we know of neither argument nor fact to invalidate this anticipation; but, on the contrary, much to invest it with a high degree of probability. Be this, however, as it may, we have in our own planet an exemplification of the phenomena which magnetism presents in one of the bodies of our system, on a scale of sufficient magnitude, and otherwise convenient for our study. Accordingly, the first object to which the British Association gave its attention was, to obtain a correct knowledge of the direction and amount of the magnetic force generally over the whole surface of the globe corresponding to a definite epoch. It has been customary to represent the results of magnetic observations by three systems of Lines, usually called isogonic, isoclinal, and isodynamic lines. (Lines of equal horizontal direction, of equal vertical direction, and of equal force.) In the maps of these lines existing in 1838, large spaces of the earth's surface were either blank, or the lines passing across them were very imperfectly supported by observations. In the more frequented parts, where observations were more numerous, the discrepancies of their dates impaired their suitability for combination; for the position and configuration of the magnetic lines have been found to undergo a *continual process of systematic change*, with the causes of which we are as yet wholly unacquainted, but which has obtained the name of *secular* change, to distinguish it from periodical variations of known and limited duration. Amongst the most marked deficiencies in these maps, were the greater part of the extra-tropical portion of the southern hemisphere,—the British possessions in North America, and British India;—magnetic surveys of these were expressly recommended, and the practicability and advantage of making the observations on board ship, and of thus extending them over the surface of the ocean, were pointed out. It is most pleasing to recall to recollection, and gratifying to acknowledge from this chair, the favourable manner in which the recommendations of the British Association were received by Her Majesty's Government and by the East India Company, and how promptly and effectually they have been carried out. The blanks in the southern hemisphere have been filled up by maritime Expeditions appointed expressly for the purpose. Magnetic surveys have been completed of British North America at the expense of our own Government,—and of the Indian Archipelago at that of the East India Company,—and India itself is now in progress; whilst owing to the zeal of our naval officers, contributions have flowed in from almost every accessible part of the ocean. The co-ordination and mutual connexion of so large a mass of materials is necessarily a work of time, but is progressing steadily towards completion, and when presented in one connected view, will form the groundwork on which will securely rest a "general theory of terrestrial magnet-

ism" corresponding to the present epoch. The magnetic phenomena, or as it is now customary to call them, the three magnetic elements, appear to be everywhere and in both hemispheres the resultants of a duplicate system of magnetic forces, of which one at least undergoes a continuous and progressive translation in geographical space, the motion being from west to east in the northern hemisphere, and from west to east in the southern. It is to this motion that the secular change in all localities is chiefly if not entirely, due; affecting systematically and according to their relative positions on the globe the configurations and geographical positions of the magnetic lines, and producing conformable changes in the direction and amount of the magnetic elements in every part of the globe. The comparison of the earlier recorded observations with those of the present epoch gives reason to believe, that viewed in its generality, the motion of the system of forces which produces the secular change has been uniform, or nearly so, in the last two or three centuries. Under favourable conditions the regularity of this movement can be traced down to comparatively very minute fractions of time. By the results of careful observations continued for several years at the observatory of St. Helena,—where, in common with the greater part of the district of the South Atlantic, the secular change of the declination exceeds eight minutes in the year, and from its magnitude therefore may be advantageously studied, every fortnight of the year is found to have its precise aliquot portion of the annual amount of the secular change at the station. This phenomenon of secular change is undoubtedly one of the most remarkable features of the magnetic system; and cannot with propriety be overlooked, as it too frequently has been, by those who would connect the phenomena of terrestrial magnetism generally, mediately or immediately with climatic circumstances, relations of land and sea, or other causes to which we are assuredly in no degree entitled to ascribe secular variation,—and who reason therefore as if the great magnetic phenomena of the earth were persistent, instead of being, as they are, subject to a continual and progressive change. It may confidently be affirmed that the secular magnetic variation has no analogy with, or resemblance to, any other physical phenomenon with which we are acquainted. We appear at present to be without any clue to guide us to its *physical causes*, but the way is preparing for a future secure derivation of its *laws* to be obtained by a repetition, after a sufficient interval, of the steps which we are now taking to determine the elements corresponding to a definite epoch.

The periodical variations in the terrestrial magnetic force, which I have before adverted to as distinguished from its secular change, are small in comparison with the force itself; but they are highly deserving of attention on account of the probability that by suitable methods of investigation they may be made to reveal the sources to which they owe their origin and the agency by which they are produced. They formed accordingly the subject of a distinct recommendation from the British Association, which met with an equally favourable reception. To investigate these variations by suitable instruments and methods, to separate each from the others, and to seek its period, its epochs of maximum and minimum, the laws of its progression, and its mean numerical value or amount, constituted the chief purposes for which magnetic observatories were established for limited periods at certain stations in Her Majesty's dominions, selected in a view that by a combination of the results obtained at them a general theory of each at least of the principal periodical variations might be derived, and tests be thus supplied whereby the truth of physical theories propounded for their explanation might be examined. We are just beginning to profit by the collocation and study of the great body of facts which has been collected. Variations corresponding in period to the earth's revolution around the sun, and to its rotation around its own axis, have been ascertained to exist, and their numerical values approximately determined in each of the three elements, the Declination, Inclination, and Magnetic Force. We unhesitatingly refer these variations to the sun as their *primary source*, since we find that in whatever part of the globe the phenomena are observed, the solstices and equinoxes are the critical epochs of the variations whose period is a year, whilst the diurnal variation follows in all meridians nearly the same law of local solar hours. To these unquestionable evidences of solar influence in the magnetic affections of the earth, we have now to add the recently ascertained fact, that the magnetic storms, or disturbances, which in the absence of more correct knowledge were supposed to be wholly irregular in their occurrence, are strictly periodical phenomena, conforming with systematic regularity to laws in which the influence of local solar hours is distinctly traced.

But whilst we recognize the sun as the primary cause of variations whose periods attest the source from whence they derive their origin, the mode or modes in which the effects are produced constitute a question which has been and may still be open to a variety of opinions; the direct action of the sun as being itself a magnet—its calorific agency in occasioning thermo-electric and galvanic currents, or in alternately exalting and depressing the magnetic condition of substances near the surface of the earth or in one of the constituents of its atmosphere,—have been severally adduced as hypotheses affording plausible explanations. Of each and all such hypotheses the facts are the only true criteria; but it is right that we should bear in mind that in the present state of our knowledge, the evidence which may give a decided countenance to one hypothesis in preference to others does not preclude their possible co-existence. The analysis of the collected materials and the disentanglement of the various effects which are comprehended in them, is far from being yet complete. The correspondence of the critical epochs of the annual variation with the solstices and equinoxes rather than with the epochs of maximum and minimum temperature, which at the surface of the earth, in the subsoil beneath the surface, or in the atmosphere above the surface, are separated by a wide interval from the solstitial epochs, appears to favour the hypothesis of a direct action; as does also the remarkable fact which has been established, that the magnetic force is greater in both the northern and southern hemispheres in the months of December, January, and February, when the sun is nearest to the earth, than in those of May, June, and July, when he is most distant from it: whereas if the effect were due to temperature, the two hemispheres should be oppositely instead of similarly affected in each of the two periods referred to. Still, there are doubtless minor periodical irregular variations which have yet to be made out by suitable analytical processes, which, possible accordance with the epochs of maximum and minimum temperature, may support in a more limited sense, not as a sole but as a co-ordinate cause, the hypothesis of calorific agency so generally received, and so ably advocated of late in connexion with the discovery by our great chemist and philosopher of the magnetic properties of oxygen and of the manner in which they are modified and affected by differences of temperature. It may indeed be difficult to suppose that the magnetic phenomena which we measure at the surface of the globe should not be in any degree influenced by the variations in the magnetic conditions of the oxygen of the atmosphere in different seasons and at different hours of the day and night; but whether that influence be sensible or not, whether it be appreciable by our instruments or inappreciable by them, is a question which yet remains for solution by the more minute sifting of the accumulated facts which are now undergoing examination in so many quarters.

To justify the anticipation that conclusions of the most striking character, and wholly unforeseen, may yet be derivable from the materials in our possession, we need only to recall the experience of the last few months, which have brought to our knowledge

the existence of what may possibly prove the most instructive, as it is certainly at first sight the least explicable of all the periodical magnetic variations with which we have become acquainted. I refer to the concurrent testimony which observations at parts of the globe the most distant from each other bear to the existence of a periodical variation or inequality, affecting alike the magnitude and frequency of the disturbances or storms. The cycle or period of this inequality appears to extend to about ten of our years; the maximum and minimum of the magnitudes affected by it being separated by an interval of about five years, and the differences being much too great, and resting on an induction far too extensive, to admit of uncertainty as to the facts themselves. The existence of a well-marked magnetic period which has certainly no counterpart in thermic conditions, appears to render still more doubtful the supposed connexion between the magnetic and calorific influences of the sun. It is not a little remarkable that this periodical magnetic variation is found to be identical in period and in epochs of maxima and minima with the periodical variation in the frequency and magnitude of the *solar spots* which Mr. Schwabe has established by twenty-six years of unremitting labour. From a cosmical connexion of this nature, supposing it to be finally established, it would follow, that the decennial period which we measure by our magnetic instruments is, in fact, a *solar period*, manifested to us also by the alternately increasing and decreasing frequency and magnitude of obscurations on the surface of the solar disc. May we not have in these phenomena the indication of a cycle or period of *secular change in the magnetism of the sun*, affecting visibly his gaseous atmosphere or photosphere, and sensibly modifying the magnetic influence which he exercises on the surface of our earth?

The determination of the figure and dimensions of the globe which we inhabit may justly be regarded as possessing a very high degree of scientific interest and value; and the measurements necessary for a correct knowledge thereof have been long looked on as proper subjects for public undertakings, and as highly honourable to the nations which have taken part in them. Inquiries in which I was formerly engaged led me fully to concur with a remark of Laplace, to the effect that it is extremely probable that the first attempts were made at a period much anterior to those of which history has preserved the record; the relation which many measures of the most remote antiquity have to each other and to the terrestrial circumference strengthens this conjecture, and seems to indicate, not only that the earth's circumference was known with a great degree of accuracy at an extremely ancient period, but that it has served as the base of a complete system of measures the vestiges of which have been found in Egypt and Asia. In modern times the merit of resuming these investigations belongs to the French nation, by whom the arc of the meridian between Formentera and Dunkirk was measured towards the close of the last century. The Trigonometrical Survey of Great Britain commenced in 1783, for the specific object of connecting the observatories of Greenwich and Paris, was speedily expanded by the able men to whom its direction was then confided into an undertaking of far greater scientific as well as topographical importance, having for its objects on the one hand the formation of correct maps of Great Britain, and on the other the measurement of an arc of the meridian having the extreme northern and southern points of the Island for its terminations. A portion of this arc, amounting to 2° 0′ 50′, viz., from Dunnose in the Isle of Wight to Clifton in Yorkshire—was published in the *Phil. Trans.* in 1803. As the whole arc, extending from Dunnose to Unst and Balta, the most northern of the Shetland Islands, would comprise more than 10°, and as nearly half a century had elapsed since the publication of the earlier part of the Survey, it is not surprising that some degree of impatience should have been felt, both by those who desired the results for scientific use and by those who were interested for the scientific character of the nation, that the general results of the survey applicable to scientific purposes shall at length be given to the world. Accordingly, at the Birmingham Meeting of the British Association in 1849 a Resolution was passed appointing a deputation to confer with the Master-General of the Ordnance, and a similar resolution was passed about the same time by the President and Council of the Royal Society. By a recent letter to my predecessor from Capt. Yolland, of the Royal Engineers, who is intrusted with the direction of the publication, I am enabled to have the pleasure of announcing that the "printing of the observations made with the Zenith Sector, for the determination of the latitudes of stations between the years 1842 and 1850 is finished, and will be presented in time for the meeting of the British Association, and that the calculations connected with the triangulation are rapidly advancing towards their completion."

In the mean time, the great arc of Eastern Europe has been advancing with unexampled rapidity, and to an extent hitherto unparalleled. Originating in topographical surveys in Esthonia and Livonia, and commenced in 1816, the operations, both geodesical and astronomical, have been completed between Izmail on the Danube and Fugleness in Finnmarken,—an extent of $25\frac{1}{3}$ meridional degrees. Next to this in extent is the Indian arc of 21° 21′ between Cape Comorin and Kaliana; and the third is the French arc already referred to of 12° 22′. It appears by a note presented to the Imperial Academy of Sciences at St. Petersburgh by M. Struve, that a provisional calculation has been made of a large part of the great arc of Eastern Europe, and that it has been found to indicate for the figure of the earth a greater compression than that derived by Bessel in 1837 and 1841, from all the arcs then at his command,—Bessel's compression having also been greater than Laplace's previous deduction. It is naturally with great pleasure that I perceive that the figure of the earth derived by means of the measurement of arcs of the meridian approximates more and more nearly, as the arcs are extended in dimension, to the compression which I published in 1825 as the result of a series of Pendulum Experiments which, by the means placed by Government at my disposal, I was enabled to make from the equator to within ten degrees of the pole,—thus giving to that method its greatest practicable extension.

The observations hitherto made on the *tides of the ocean* have been insufficient to furnish such a connected knowledge of the subject as would enable us to follow the course of the tide over any considerable portion of the ocean; and in the opinion of persons most competent to judge, it is only by systematic observation, specially directed for the purpose, that this connected knowledge is likely to be obtained. The recent researches of Capt. Beechy, which have given a new and unexpected view of the tidal movements of the ocean, show how much yet remains to be learnt respecting the tides even for the practical purposes of navigation.

The facts derived a few years since from the barometrical observations at St. Helena, showing the existence of a *lunar atmospheric tide*, have been corroborated in the last year by a similar conclusion drawn by Capt. Elliott, of the Madras Engineers, from the barometrical observations at Singapore. The influence of the moon's attraction on the atmosphere produces, as might be expected, a somewhat greater effect on the barometer at Singapore, in lat. 1.° 19, than at St. Helena, in lat. 15.° 57. The barometer at the equator appears to stand on the average about 0.006 in. (more precisely 0.0057, in lat. 1°.19) higher at the moon's culminations than when she is six hours distant from the meridian.

We have received from our valued Corresponding Member Prof. Dove, for presention to this Meeting, an important continu-

ation of his researches on the temperatures at the surface of the globe. In former communications he has furnished us with maps showing, so far as observation permits, the isothermals of the whole globe in every month of the year. He has now given us, —first, the *normal* temperatures of each parallel of latitude in each month; being the average of all the temperatures in that parallel in such month,—and, second, the *abnormal* temperatures, or the difference between the temperature of each place and the mean temperature of its parallel. From these again are formed lines of *abnormal temperature* for each month—surrounding and marking out those districts or localities which, from peculiarities of the surface or other causes affecting the distribution of heat, are characterized by excessive abnormal heat or abnormal cold. The importance of these researches on the general theory of the causes which interfere with the equable distribution of heat according to latitude, is obvious.

The activity which has prevailed so greatly of late in the collection of meteorological data has been almost exclusively confined to that portion of the surface of the globe which is occupied by land, although the portion covered by the ocean is not only much greater in extent, but is also better suited for the solution of several meteorological problems. Many striking examples might be adduced to show that it is "systematic direction," and not "individual zeal" in naval men, which has been wanting; and it has been therefore with great satisfaction that meteorologists have learnt that a proposition has recently been made from the United States Government, to the British Government to undertake, conjointly and in co-operation, a system of meteorological observations, to be made at sea in all ships belonging to the naval service of the two countries, and sufficiently simple to be participated in by the merchant service also. In a partial trial which has been already made of this system in the United States, it has been found to produce results which, exclusively of their scientific bearing, are of great importance to the interests of navigation and commerce, in materially shortening passages by the knowledge of prevailing winds and currents at particular seasons. The practical advantages arising from the co-ordination of the observations in the Hydrographic Office of the United States, and the circulation of the charts of the winds and currents, and of the sailing directions founded on them, have been such and so appreciated, that there are now, as it is stated, more than one thousand masters of American ships engaged in making them. The request for British co-operation in an undertaking so honourable to the country in which it originated, was referred in the spring of this year by the Earl of Malmesbury to the President and Council of the Royal Society for a Report.

Amongst the most valuable results which Physical Sciences may expect to obtain from this extensive system of nautical observation, we may reckon the construction of charts of the isothermals of the surface of the ocean corresponding to every month in the year, similar to Prof. Dove's monthly isothermals of the temperature of the air; and a knowledge of the normal condition as well as the abnormal variations, with their special causes and effects, of the great Gulf-stream which connects the shores of the Old and New World, and in its normal effects is influential in many ways on the climate of the United States and Western Europe, whilst its abnormal effects are principally known, so far as we are yet aware, by the peculiarities of climate which they occasionally produce on the European side of the Atlantic. Of the extent, depth, and limits of this remarkable current in ordinary and extraordinary years we are as yet very imperfectly informed. Of the zoology of the great tracts of ocean which are covered by its banks of seaweed, we know nothing beyond the fact that they are the habitation of a countless number of oceanic animals—giving rise possibly to deposits which may have distinctive characters from littoral deposits or from those of marine estuaries. But doubtless we can now estimate only a small part of the advantages which Terrestrial Physics as well as Hydrography and Navigation would derive from the concurrent exertions of the two great maritime nations in the way that has been pointed out.

The analogy of the configuration of the land and sea on the north of the continents of Asia and America has for some time past caused an opinion to be entertained that the sea on the north of the Parry Islands might be as open as it is known to be throughout the year in the same latitude on the north of the Siberian Islands. The expectation that Wellington Strait might, as a continuation of Barrow's Strait, prove a channel of communication from the Atlantic into that part of the Polar Ocean, has been considerably strengthened in the last year by the discoveries which we owe to the hardihood and intrepidity of our merchant seamen. The access to the Polar Ocean, and the degree in which it may be navigable for purposes of discovery or scientific research, are amongst the few geographical problems of high interest which remain to be solved; and we may confidently look for a solution, in the direction at least that has been adverted to, by the Expedition which has been despatched under Sir Edward Belcher to follow up the discovered traces of Sir John Franklin's vessels.

Gentlemen, I have now occupied fully as much of your time and attention as I can venture to trespass on,—and yet have found it impossible to comprehend within the limits of a discourse all the topics to which I would have gladly called your notice, even in those branches of knowledge in which I may consider myself as least uninformed, in three of the seven departments into which our science is divided. I have left wholly untouched those wide fields of Geology and Natural History, which would of themselves have furnished fitting subjects for an address of still longer duration. No one can be more sensible of this, and of many other imperfections and deficiencies, than the individual who addresses you; yet, if he has not wholly failed in the purpose he designed—if the impression which he has endeavoured to convey, however faint may be the image, be true to that which it is intended to represent—you have not failed to recognize the gratifying picture of British Science in the full career of energetic action and advancement, pressing forward in every direction to fill the full measnre of the sphere of its activity in the domain of intellectual culture; regardful on the one hand of the minutest details in the patient examination of natural facts, and on the other hand diligent in combining them into generalizations of the highest order, by the aid of those principles of inductive philosophy which are the surest guide of the human intellect to the comprehension of the laws and order of the material universe.

Vortex Water Wheel.

On a new form of Vortex Water-Wheel. By J. Thomson, C. E.

This wheel, Mr. Thomson observed, is a new variety of the general class of water-wheels called turbines. In this machine the moving wheel is placed within a chamber of a nearly circular form. The water is injected into the chamber tangentially at the circumference, and thus it receives a rapid motion of rotation. Retaining this motion, it passes onwards towards the centre, where alone it is free to make its exit. The wheel which is placed within the chamber, and which almost entirely fills it, is divided by thin partitions into a great number of radiating passages. Through these passages the water must flow on its course towards the centre, and in doing so imparts its own rotatory motion to the wheel. The whirlpool of water acting within the wheel-chamber being one principal feature of this turbine, leads to the name vortex as a suitable designation for the machine as a whole. For some time past there have been several of these new turbines in course of construction and erection. The one

first completed and brought into action for practical use was for a new beetling-mill of Messrs. C. Hunter & Co., of Dunadry, near Antrim. It was constructed in Glasgow, and on being brought across the channel and erected at its destination, its first trial was made on the day before Christmas last. This trial proved completely successful, and the subsequent performance of the machine has been highly satisfactory.

Mr. Thomson explained that the velocity of the circumference is made the same as the velocity of the entering water, and thus there is no impact between the water and the wheel; but, on the contrary, the water enters the radiating conduits of the wheel gently, that is to say, with scarcely any motion in relation to their mouths. In order to obtain the equalization of these velocities it is necessary that the circumference of the wheel should move with the velocity which a heavy body would attain in falling through a vertical space equal to half the vertical fall of the water, or, in other words, with the velocity *due* to half the fall; and that the orifices through which the water is injected into the wheel-chamber should be conjointly of such area that when all the water required is flowing through them, it also may have a velocity due to half the fall. Thus one-half only of the fall is employed in producing velocity in the water; and, therefore, the other half still remains acting on the water within the wheel chamber at the circumference of the wheel in the condition of fluid pressure. Now, with the velocity already assigned to the wheel, it is found that this fluid pressure is exactly that which is requisite to overcome the centrifugal force of the water in the wheel, and to bring the water to a state of rest at its exit, the mechanical work due to both halves of the fall being transferred to the wheel during the combined action of the moving water and the moving wheel.

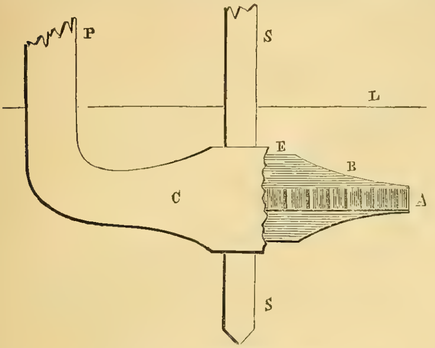


Fig. 1.—Elevation and Section.

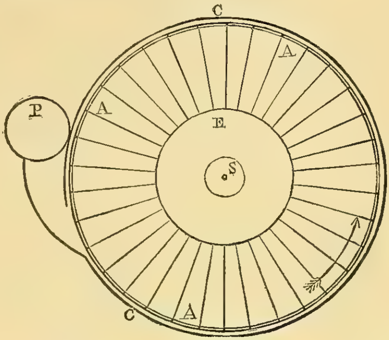
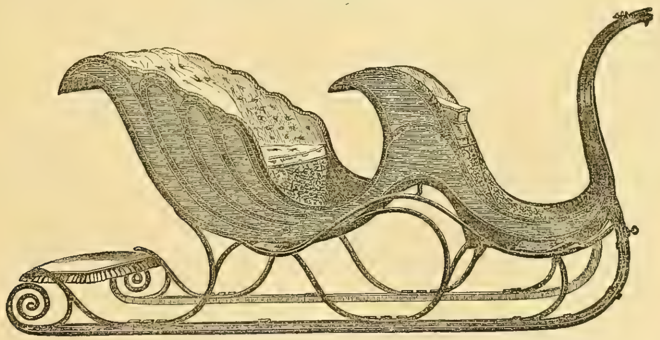


Fig. 2.—Plan.

Fig. 1, is an elevation and section, and fig. 2, a plan of this machine. B, is the body of the wheel, which is broad in the centre, and tapers off to the circumference, having a space A, of about three inches for the entrance of the water; E, is the central aperture for the discharge of the water, which flows out above and below; P, is the conduit-pipe through which the water is injected against the sides of the radiating passages A A A; C, represents a portion of the outer case; and S, is the vertical shaft fixed to the wheel, and revolves with it. The wheel is worked a few inches below the level L, of the water.—*C. E. and A. Journal.*

Sleighs and the Sleighing Season.



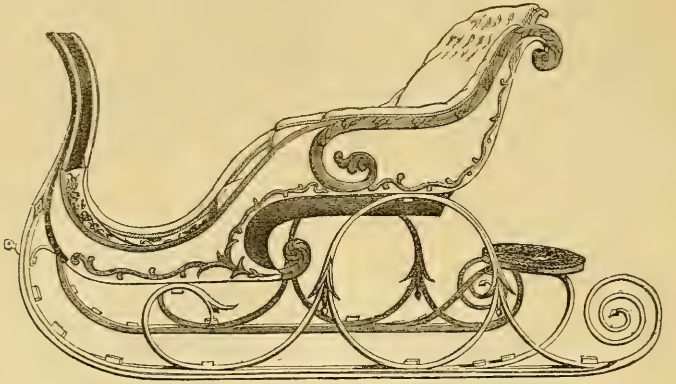
Double Sleigh, manufactured by Mr. J. J SAURIN, of Quebec.

The snow which fell on the 27th of November, reminded us of the delightful sleighing season, which all at this period of the year, look forward to with delight. The merry bells of the sleigh enlivening our streets, give a charm to Canadian winter life, which can scarcely be understood in the more temperate, but less cheerful climate of England.

The sleighs sent from Canada to the Great Exhibition, (of which we give two illustrations,) attracted many admirers, and

led to inquiries among the uninitiated curious as to their object and use.

At the commencement of winter, we constantly hear the question asked, whether we shall have much sleighing during the approaching season. This is indeed a momentous question to farmers and country storekeepers. No inconsiderable portion of the reward of almost a year's industry, is dependant upon good sleighing! Winter is the season when the farmers of the back townships bring their produce to market, and in the absence of sleighing, all the terrible evils of bad roads are felt in the extreme. It were vain to attempt to satisfy ourselves respecting the probability of the continuance of good sleighing weather during the coming winter. The completion of our magnificent system of Railways will render this question less important than it now is.



Single Sleigh, manufactured by Messrs. McLEAN & WRIGHT, of Montreal.

Few people have an idea of the number of days on which rain and snow falls in the vicinity of Lake Ontario during the winter months, although that number is accurately known for Toronto during a period of eleven years, yet, from such data we can scarcely form a correct idea of the duration of snow upon the ground, which determines the amount of benefit we are to derive from it as an admirable means of traffic. We give below the number of rainy and snowy days which have occurred at Toronto during the months of December, January, February and March, for the last eleven years.—(See Toronto Meteorological Reports.)

Rain.

	DECEMBER.		JANUARY.		FEBRUARY.		MARCH.	
	Days.	Inches	Days.	Inches	Days.	Inches	Days.	Inches
1840...	3	—	—	—	8	1.4	14	3.4
1841...	7	6.6	2	2.1	1	—	3	1.3
1842...	3	0.8	5	2.1	8	3.6	8	3.7
1843...	6	1.0	6	4.2	1	0.4	7	3.1
1844...	6	—	7	3.0	4	0.4	10	1.5
1845...	2	—	5	—	5	—	11	3.2
1846...	5	1.2	5	2.3	0	0.0	10	1.3
1847...	7	1.1	7	2.1	2	0.5	8	2.8
1848...	7	2.7	7	2.2	4	0.7	5	1.4
1849...	5	0.8	4	1.1	2	0.2	10	2.6
1850...	2	0.1	5	1.2	7	1.2	9	4.7
1851...	6	1.0	4	1.2	7	2.6	11	2.2
1852...	—	—	0	None	3	0.6	6	1.9

Snow.

	DECEMBER.		JANUARY.		FEBRUARY.		MARCH.	
	Days.	Inches	Days.	Inches	Days.	Inches	Days.	Inches
1840...	18	no rec'd	—	no rec'd	6	no rec'd	2	no rec'd
1841...	5		14		9		3	
1842...	17		9		9		2	
1843...	8	8.1	12	142	21	14.4	3	0.1
1844...	6	4.2	11	24.9	7	10.0	1	—
1845...	12	4.7	9	22.7	9	19.9	4	1.5
1846...	9	6.0	10	6.0	13	46.1	2	1.3
1847...	8	6.8	5	7.5	13	27.3	2	4.0
1848...	7	16.5	8	7.1	8	10.8	1	0.5
1849...	12	9.6	10	9.2	13	19.2	2	1.7
1850...	18	29.5	8	5.2	9	23.1	2	1.1
1851...	15	10.7	10	7.8	4	2.4	3	1.2
1852...	—	—	19	30.9	11	13.0	4	9.4

Cultivation of Flax.

(Extracts from a paper read at the Royal Cornwall Polytechnic Society.)

Mr. Charles Fox, exhibited a specimen of flax prepared on his farm, it being merely bruised, and the manager of M. Claussen's works in London had told him, that though not equal to their best samples, it was fit for their purpose. The manufacturers in Ireland, did not think Claussen's process would be very applicable to their purpose; they also think lightly of Schenk's process; for what reason, he (Mr. Fox) was not aware. But he was glad to find that the Irish manufacturers are extremely sanguine of the success of Watt's process. The great advantage of Watts' over Schenk's process was, that Watt's takes the straw when only deprived of the seeds by a machine costing about £10, whereas Schenk's, he apprehended, must have the straw further prepared in some way, though not retted. By Watts's process the straw is put in hot water in a close vessel, and afterwards bruised in a machine which presses out the moisture, whilst it breaks the ligneous fibre; it is then dried by hot air. Cattle are found eagerly to drink the flax soup made by this process. It is evident from paintings on the walls of some of the Egyptian tombs, that they steeped their flax in hot water even before the Exodus, and Professor Robinson has found that the fibre of some of the linen of their mummies, is finer even than that of the Decca Muslin. Mr. Fox further said the gentlemen of Belfast conceive that Watts is in earnest, for he has a thousand tons of straw on his premises to undergo the process, and has laid out £1500 in vats and other necessary things. The produce on Mr. Fox's farm had been two quarters of linseed and 2,800 lbs. of straw to a statute acre, which straw exposed to bruising machinery would give about 11-28ths of the broken

stalk. The produce of seed per statute acre amounted to the value of £5 16s., which was nearly equal to the value of wheat per acre—supposing the straw valueless; having also this advantage over wheat, that the flax might be sown in the spring and pulled up even before the wheat crop. It was not to be wondered at that the farmers of this country had long ago abandoned the growth of flax, considering the trouble and expense of retting, exposed in ponds, with constant watching necessary. The seed also, which at least trouble is the most profitable part was then neglected. But if by any such plan as Mr. Watts's they could readily convert the flax straw grown in the fields to the purpose of manufactures, the objections to its growth would be greatly obviated, and it would be remunerative. In Fife they have now five hundred acres of flax grown. Some conversation then ensued. Mr. Sowell, of Penryn, said the society had offered a £5 premium, and a machine had been promised, yet although he had stimulated parties to grow flax, (nearly a ton weight growing in Constantine,) still he had received neither the £5, nor the machine. Sir C. Lemon inquired how much the bulk was diminished by the use of the simple machine Mr. Fox had spoken of? Mr. C. Fox replied, it was diminished about 17-28ths, but the whole taken away was not useless; the finer flax, however, was about 11 lbs. in 28. Maclean and Co's. machine breaks 56 lbs. of straw per hour into 22 lbs. of flax, 14 lbs. of clean tow, 12 lbs. of straw, and 8 lbs of roots and refuse. After some further inquiries in reference to the process, Sir Charles Lemon referrring to what Mr. Sowell had said, stated that last year he said he would give £5 towards the purchase of a machine, and Mr. Enys said he would also give £5, it being then understood it would cost only £10. He was ready now to renew that promise. He also asked Mr. Sowell how his crop of nettles got on, which he talked about last year? Mr. Sowell said he had grown a crop of nettles this year in his garden, and they had produced excellent flax, though no seed. It was long, but considerable coarser than that grown from the flax plant.

EDITORIAL NOTICES.

In enumerating the list of members of the Canadian Institute, we omitted to place the name of Mr. Vincent Parkes, among the list of Life Members; Mr. Parkes having been elected an Honorary Life Member, on account of the services he has rendered the Institute. We shall be enabled to furnish a corrected list after the annual election of officers and members of the Institute, which will take place on Saturday, December 11th.

We regret that the October and November numbers of the Journal have been delayed beyond the time specified for their publication. The difficulty of procuring suitable paper for the Journal, and other causes over which we had no control, have led to their somewhat tardy appearance. We solicit the kind forbearance of our readers in these matters, and we hope that such measures have been taken as will secure the appearance of each future number at its appropriate season.

We are happy to have it in our power to announce that through the courtesy of a zealous member of the Canadian Institute, we shall be enabled to furnish a record of Canadian Patents in the order of their grants.

Canadian Institute.

NOTICE TO MEMBERS.—The Session of the CANADIAN INSTITUTE for 1852-3 will commence on Saturday, December 4th. Members of the Institute will meet in the Government House. The business of the evening will include the nomination of Officers for the ensuing year, and the discussion of matters relating to the organization of the Institute.

The Second Meeting of the Institute will take place on Saturday, December 11th. The election of officers will then be proceeded with.

REVIEWS.

Scobie's Canadian Almanac for 1853. HUGH SCOBIE: *Toronto.*

It speaks well for the progress of Upper Canada, that it is possible for an enterprizing publisher to have compiled and printed ninety-six octavo pages of close matter, in small type with any amount of figure, and a good map of the country got up especially for the work, and all for the paltry sum of sevenpence half-penny. And yet, such is Mr. Scobie's Almanac for 1853. The Astronomical and Meteorological portions are highly interesting. The notes appended to the Meteorological table for Balsam Lake. contain some curious and even startling records. Very delightful indeed for our Balsam Lake savans to have the opportunity of making notes like the following!—1841, Aug. 11, two calves killed by wolves; 1850, Aug. 20, *bears in the wheat*; 21st shot a bear, &c. &c. Its well for Toronto sportsmen that Balsam Lake is some 70 miles to our north-east, and sufficiently inaccessible. We notice the introduction into the Almanac before us of some admirable articles on subjects of general interest which do not usually find a place in such publications,—one on 'Gold and Silver,' and another on the 'Winter of 1851-2 in Upper Canada,' contain much interesting information of great value for reference. The Tariffs of Britain, United States, Canada, and the N. A. Provinces are given in all their important details. Besides many highly valuable tables and lists relating to representation of Law, Physic and Divinity in this Province, we find a Regnal table for computing dates; the Statistics of Schools for all the Provinces of British America: the Census Returns for 1852, together with a Statement of the Affairs of Canada and sister Provinces

An immense amount of information is compressed into an exceedingly small space, and altogether the work does infinite credit to the energy of the publisher as well as to the Province, which can so appreciate its value as to absorb an immense edition with that promptitude which renders its publication possible in the country.

"*Reports by the Juries—Exhibition of the Works of Industry of all Nations* 1851." London: W. Clowes. 1852.

We have received a copy of this extraordinary work. It seems as though the wonders connected with the Great Exhibition are never to cease, and the Commissioners never to be weary of their labours. After all the great and glorious successes appertaining to the Exhibition, —its organization,—its building,—its wonderful collection,—the concourse of its visitors,—the order of all its details,—its catalogues,—the award of the prizes, and their distribution,—after all these, each in itself an evidence of most judicious conception and most perfect realization, we now have before us a quarto volume of nearly 900 pages, containing the principles laid down for the guidance of Jurors in making their awards, the classification of subjects in detail of the thirty classes into which the Exhibition was divided, a list of the Jurors, a list of the awards, and the explanatory and descriptive Reports of the Juries in reference to the articles rewarded, with, finally, a complete Index, which facilitates reference to every note-worthy item of the Exhibition, either by the medium of the name of the country, of the exhibitor, or of the article rewarded.

The value of these Reports cannot be too highly estimated. They embody the deliberate and unprejudiced opinions of the greatest celebrities amongst the savans of Europe, on the most recent and valuable illustrations of the Practical Science, the Industry, Ingenuity Taste, and Skill of the world; and, as such, are alike invaluable for present teaching and Historic record.

We most strongly commend this volume to the close and careful study af all who, not content with the excitement, desire to share in

the sterling and instructive results of the Exhibition ; and in doing so, we must not omit to congratulate the Canadian Exhibitors, to all of whom a "Presentation Copy" is, we understand, about to be sent, as an acknowledgment by the Commissioners of their co-operation.

In most of the Reports we find some commendatory reference to Canadian contributions; but it is especially in connection with the Geological Collection formed and transmitted by Mr. Logan, that the highest honours have been accorded to the Province. "Of all the " British Colonies" (says the Report) "Canada is that whose exhibition " is the most interesting and the most complete ; and we may even say " that it is superior, as far as the Mineral Kingdom is concerned, to all " countries that have forwarded their products to the Exhibition. " This arises from the fact that the collection has been made in a " systematic manner, and it results that the study of it furnishes the " means of appreciating at once the Geological structure and the " Mineral resources of Canada. It is to Mr. W. E. Logan, one of the " members of the Jury, who fills the office of Geological Surveyor of " Canada, that we are indebted for this collection; and its value arises " from the fact, that he has selected on the spot most of the specimens " that have been sent to the Exhibition, and has arranged them since " their arrival in London. The arrangement that he has adopted, " which is entirely technical, includes eight divisions" (detailed in the Report), "and all these classes include materials of great interest for " industrial purposes."

The reporter then proceeds to mention the several items of the collection. The ores of iron are noticed for their "abundance and excellent quality,"—the Marmora and St. Maurice mines being honourably referred to. The ores of zinc, lead, and copper, are respectively reported, the latter from Lakes Superior and Huron being characterized as "remarkable for their richness." The native silver from the Island of Ignatius, on Lake Superior, and the pepites of native gold from the Rivers of Canada East, are the objects of honourable mention, as also are the white quartzose sands of Messrs. Bondom and Lebare, used by them with advantage in the manufacture of flint and crown glass.

"The last award," continues the Report, "which we have to mention " in the case of Canada, is the honourable mention adjudged to Mr. " Logan, who has exhibited iron ores, lithographic stones, minerals, " and various rocks. Our colleague has not thought it right to add to " these the Geological Map he has made of Canada, a matter which the " Jury greatly regret, not because they would then have been able to " adjudge a higher reward for this beautiful work,—for the position of " Mr. Logan, as member of the Jury, would render this impossible ; " but because of the great interest it would have added to the Canada " Exhibition."

"The lithographic stones exhibited by Mr. Logan belong to a " palæozoic rock, occurring at Marmora, where the magnetic iron ore " has been mentioned as forming a deposit of enormous thickness. " These stones are remarkably homogeneous and fine grained; the " degree of finish of the drawings that Mr. Logan has caused to be " made upon them giving every promise of the quality being good. " The Geological position of the stones is interesting, and the reporter " is not aware of such material having been previously found in the old " rocks, since, up to the present time, those who practise Lithography " seek for stones from rocks of the oolitic series. The discovery of Mr. " Logan, proving that the palæozoic rocks may also furnish good " Lithographic Stones, increases the resources available for this impor- " tant branch of Engraving and Drawing.

"We must also notice, amongst the articles exhibited by Mr. Logan, " a cast of the footsteps of an animal discovered in one of the argillace- " ous schists of the palæozoic period. When this schist was first laid " bare to a certain extent, Mr. Logan observed the impressions of foot- " steps repeated several times, and he had the upper bed removed to " satisfy himself as to whether they were continued. Their existence, " under these circumstances, fully proves that the markings were made " at the time of deposit of the bed, and thus carries back the existence " of quadrupedal animals to the earliest Silurian epoch. The length of " the track discovered is eight feet, and as many as twenty impressions " of each foot are traceable. Besides these is an impression between " the footmarks, which may be regarded as the trail either of the " abdomen or the tail of the animal."*

We have made these extracts (which, however, from want of space, we are unable to complete), not only because they are honourable to the Province, but because they bear evidence to the valuable services of the distinguished President of the Canadian Institute, who has, in connection with the Great Exhibition, not alone promoted the interest, of Canada, but, by his researches, has made important additions to scientific knowledge.

In the Agricultural Section, Canada is mentioned as sending "a fine " supply of Wheat, all of the ordinary English kinds, but *every* sample " of more than ordinary excellence." Mr. Christie's White Wheat is commended, and the Polish Oats of Mr. Watts are mentioned as being of "admirable quality," as is also the Barley exhibited.

The Canadian Buckwheat exhibited by E. Frenholme is characterized as "the finest sample" in the Exhibition, being superior to that sent from the United States, Russia, and Belgium.

The Hops, Linseed, Arrowroot, Hemlock-bark, Flax, and Timber, Raw Silk, Porpoise Oil, and Glue, are each specially commended, and some useful suggestions made with reference to their marketable value.

The Type and Stereotype Plates from the Foundry of Mr. Palgrave of Montreal, are mentioned as being "very beautiful."

" From Canada West," says the Report, "there is a large assortment " of Axes and Tools, the former especially of excellent quality, and " proving the skill and power of her Artizans to supply those particular " articles to which her physical exigencies give the highest importance." The names of S. Shaw of Toronto, C. P. Ladd of Montreal, G. Leavitt, and Scott & Glassford, are honourably mentioned in connection with the manufacture of Axes, and A. Wallace with that of Planes.

For Stoves, the name of G. H. Cheney is honourably mentioned, as is that of Mr. Ladd of Montreal for Balance Scales.

For Coopers' Work, the name of J. Bailey stands first on the list, the Canadian Pails being reported as very superior, and, both on account of the neatness and durability of the workmanship and the cheap price at which they are sold, well calculated for extensive use in Europe.

We shall close our extracts (necessarily very imperfect) by a reference to Clay Pipes, which one of the Juries seem to have appreciated very highly; and to Confectionary, in which we do not appear to have excelled, for the Report, with very matter-of-fact facetiousness, observes that "Canada sends an unimportant contribution of Confectionary, " consisting of Horehound-Candy, reputed in that Province to be a " most excellent specific for a cold ; *a merit which an experiment did not confirm!*" Perhaps we may comfort the unsuccessful exhibitor by observing, that a fair test of Canadian Horehound can only be obtained *in Canada.* Doubtless our countryman never presumed to offer it as an antidote to London fog, or a specific for its troublesome effects ! As to the Clay Pipes, the amiability of the Report induces us to conclude that "*the experiment*" was very agreeable.

Report of the Commissioners of Public Works, for 1851. *Printed by order of the Honourable the Legislative Assembly. Quebec*—ROLLA CAMPBELL : 1852.

We have a copy of this important Report before us, in the shape of a very shabby looking quarto pamphlet of 91 pages, with poor typography, coarse paper, and a vulgar yellow wrapper, so unconscionably mean that it would disgrace the cheapest edition of the most trashy

* These tracks are now thought to have been produced by a gigantic Mollusk : not a quadrupedal animal.

Romance published in Yankeedom. A "State paper" of so much and such permanent importance and value as this deserves more care in its issue: a collection of these Reports embodies the history of all the public works of Canada, and is therefore, and will always be, of the highest interest. This, however, does not seem to be appreciated by the parties entrusted with the publication, for the same meanness which characterizes the mechanical execution of this Report—for which by the bye neither the Board of Works nor the printer can be held responsible—seems to have been allowed to controul its distribution, so small a number of copies having been printed, that to obtain one, even as a matter of public business or of personal favour has, from the first day of its publication, been extremely difficult. Documents of this class, as for instance, Mr. Logan's invaluable Geological Reports, Reports on Railway Enquiry and Legislation, on Prison Discipline, on Provincial Surveying, and the like—are public property, and are to a large class of persons of great practical value, and ought to be widely circulated for public information. Not one copy, however, as far as we can learn, can be obtained for any public library, unless indeed a member of parliament claims gratitude by generously foregoing his privilege in its favor. This would not be of so much importance if the documents in question could be purchased, but immediately that the small "regulation" number has been struck off, the printers' devil distributes the type, hungry libraries and scientific societies to the contrary notwithstanding, and therefore they are not to be obtained for love or money. We trust that this will speedily be amended by the *authorized distribution* of all parliamentary papers having any scientific bearing, to the respective public libraries and scientific corporations throughout the Province. We commend the subject to the consideration of our parliamentary friends—an order of the House, or even the Speaker's order, would effect the desired object.

We proceed now to consider the Report, which bears date August, 1852, and refers first, to the Welland Canal, recommending with great judgment the lighting by gas the locks on that part of it between St. Catharines and Thorold, which includes twenty-three of the locks, and other improvements calculated to facilitate its use.

The revenues are reported as steadily "continuing to increase."

In 1849, the gross tolls amounted to			- - -	£34741	18	8
In 1850,	do.	do.	255 days navigation, -	37925	17	7
In 1851,	do.	do.	261 do. do. -	50460	6	8

Shewing an increase of about 10 per cent. in 1850 over 1849, and of 33 per cent in 1851 over 1850, while the receipts up to 1st August in 1852 amounted to £23,352 7s. 5d., and to the same period last year, £21,154 11s. 5d.

The expenditure on this canal in the year 1851, was £30,968 10s. 10d. The vote now required is £33,046 0s. 0d., which, with an unexpended balance from last year of £29,360 4s. 1d., gives a present contemplated outlay of £62,406 4s. 1d., for what purposes however does not clearly appear, the items of the service not being given, but the well-known voracity of the "deep cut" has not yet, we suppose, been satisfied, since we see that "the contractor Mr. French is steadily progressing with his dredging operations" to effect the deepening of that portion of the work so as to adopt Lake Erie as the summit level.

The canal, it seems, is to be crossed by two Railways now in progress,—the Brantford and Buffalo, and the Great Western. Of course the Commissioners give a mysterious hint of some threatened "obstruction of the navigation." Every Railway that was ever proposed over any canal or navigable river has appeared as "an obstruction of the navigation," *lcoming in the future* in the prophetic vision of some merciless official authority. Poor Stephenson and his seven hundred thousand pounds worth of tubular bridge was a victim to this sort of thing—a *fortunate* one truly, if the triumph of his skill rather than the cost of its exercise may be taken as the standard.

Happily our Commissioners are not so difficult to please in such matters;—as in duty bound they have teazed the Engineers a little about "the obstruction," but have eventually "adjusted the difficulty."

The St. Lawrence Canals are reported as having been opened throughout on 25th April, and closed on 25th November, thus affording 215 days for the season of 1851. The Tolls during that year are not specially alluded to in the body of the Report, but by appendix No. 1 they appear to have been £52,812 11s. 6d., reduced, however, by the cost of repairs, collection and management to £10,901 1s. 8d.

The "movement" on these Canals, *up and down collectively*, has suffered a diminution in 1852 as compared with 1851 of 13,630½ tons of "all property moved;" and of 10,266 in "the tonnage of vessels." In the tonnage of steamers on the contrary there was an increase of 25,354 tons, and in the number of passengers of 8059; we infer, therefore, that the decrease is due to the removal of the tug boats rather than to any other depreciation of the route, which in connection with steam is evidently growing in favour. The above statement however cannot be taken as strictly illustrative of the comparative business of the two years, for it has been made up to an arbitrary date, 1st July, in both, whereby 1851 obtains an advantage of 10 days over 1852, in consequence, probably, of an earlier opening. The Commissioners, indeed, claim a rise in the "movement," reckoning by the average daily traffic. But this manifestly gives an incorrect result, since the property in transit doubtlessly accumulated previous to the later opening in 1852, and was pushed forward with greater despatch so as to increase the daily movement in the commencement of the season of navigation. To make the comparison good the business of a like number of days from the opening in each season should be given. The amount expended on these canals in 1851, was £36,702 6s. 0d., the vote now required is £39,827 18s. 6d., which, with an unexpended balance from last year of £31,464 1s. 6d., gives a present contemplated outlay of £71,292 0s. 0d.

The clauses of the Report referring to River Lights, Slides, Roads and Bridges, demand no special comment; in the matter of the "harbours," and "piers below Quebec," however, we perceive this contrast,—that whilst the "Whitby, Dover, and the Rondeau Harbours have been sold," and the interests of navigation and commerce in connection with such works thus left in Upper Canada (we do not say unwisely) to local care and private enterprize, a large expenditure is being incurred on the banks of the St. Lawrence below Quebec in the construction of piers, with reference to which the Commissioners assert "no reasonable doubt can be entertained but that they will be of infinite importance towards *the improvement of their several respective localities*, and tend materially to *the accommodation and convenience* of the shipping navigating the river." There seems to be an inconsistency of principle here scarcely traceable to any but a geographical basis.

Referring to "Public Buildings," the Commissioners Report a total past expenditure on Government buildings in Toronto of £19,419 19s. 4d., and a contemplated outlay there of £10,000 on a Government House, and £2183 2s. 8d. on the Post Office, making a total of £31603 2s. 0d.

The past expenditure on similar service at Quebec appears to have been £17,427 4s. 9d., and the further outlay is estimated at £38,047 13s. 10d., making a total of £55,474 18s. 7d.

The Architectural legacies bequeathed to the Commissioners by their predecessor, seem to have been more embarrassing than profitable. The suspension of the Montreal Court House "in consequence of grave errors of design in arrangement," troubled them in that city, whilst "the total abandonment during progress of the original plans for the Parliament buildings and the substitution of others," with such mistakes at Spencer Wood as have led them to "regret that the first step taken was not that of pulling it down," would appear to have bothered them at Quebec.

We come now to the consideration of that important and interesting

part of the Report relating to the construction of a Canal to connect Lake Champlain with the St. Lawrence.

"The object of a Canal," they submit, "to connect Lake Champlain with the St. Lawrence, is to furnish a cheaper, quicker and (from reduced transhipments) a more desirable route to the great trade which passes between tide-water in the Hudson River—the Railroads of New England, and the city of New York, on the one hand; and the Western States and Canada, on the other—and by so doing to bring traffic and tolls to the St. Lawrence Canals, which, by the completion of the Oswego and Erie Canals, and Ogdensburgh and other Railroads, and the want of an efficient connection between them and Lake Champlain, obtain scarcely any of the transit trade between the Atlantic and the Western States, or Canada. For this transit trade, this Canal would compete with the Erie and Oswego Canals; the Erie, New York, Central, Ogdensburgh and Cape Vincent Railways," and in this competition the Commissioners submit it would be successful.

They argue that whilst such a Canal would open the great lumbering Districts of the Ottawa, and of the Upper and Lower St. Lawrence to the greatest lumber market in the world—that of Albany and Troy—it would afford to the Districts on Lake Champlain a shorter and cheaper route for imports of coal, iron. salt, fish, oil, &c., which, in consequence of tonnage entering inwards in ballast can be laid down cheaper in Quebec than in any port of the Union.

Independently, however, of these items of traffic, the trade for which it would contend is stated to be—1st. "Through tonnage *down*" arriving at the Hudson from the Western States or Canada, via Buffalo, Oswego and Whitehall, which collectively amounted in 1851 to 1,047,684 tons of the value of £7,096,494. 2nd. "Through tonnage *up*" leaving the Hudson for the Western States or Canada, by the same inland ports collectively, in the same year, 192,023 tons, of the value of, say £15,742,460. Upon this trade of course it is fair to calculate a rise, for it has more than trebled during the last six years, and the construction of 1000 miles of Railway per annum in the North Western States, (tending as it does to the direction of the Ohio and Mississippi trade to the Lakes in preference to New Orleans) cannot but exercise a powerful influence in its favour.

It is found that the traffic of the Welland Canal has increased in a greater ratio than the Erie Canal, as the Oswego route has progressed more rapidly than that by Buffalo, simply because the Boat Canal navigation has thereby been shortened 154 miles, but this Canal would diminish the Boat Canal navigation 297 miles.

In point of *time*, a freight steamer from Cleveland would deliver her cargo in 4½ days at Whitehall, whence it would reach Albany in 1½ days more, making six days time against nine days by Buffalo and the Erie Canal.

In point of *expense*, the whole cost of the carriage of a barrel of flour from Hamilton to New York, is 3s. 3d., via Ogdensburgh and Whitehall. By this canal it would be 2s. 9d. The cost of a barrel of flour from Cleveland to New York via Buffalo and Albany, is 3s. 0d., by this canal it would be 2s. 5d.

As in competition with the Railroad route, one transhipment is saved, and as in competition with the Erie Canal, a length of 297 miles of boat navigation is avoided.

In convenience, expense, and time, therefore, the Commissioners claim for the Champlain Canal the superiority over all its rivals, even without reference to the enlargement of the canal from Whitehall to Troy. If, however, this latter should be effected, the "through transport" without transhipment from the Upper Lakes to New York in 500 ton steamers would be secured, placing the route above all rivalry as an unequalled chain of inland navigation *towards New York*.

The cost of the work is estimated at £100,000,—but no sooner do the Commissioners make this announcement than they drop the subject After the pains they had taken to prove the case, we were prepared for a strong recommendation that the work should be undertaken, but we find that they only intended to submit "their views and suggestions" without any effort to give them a practical application.

Favourable, however, as is the view which they have taken of this subject, in connection, and indeed *solely* in connection with the trade of the Hudson River and New York, we cannot help thinking they might with some advantage have turned their eyes towards the Lower St. Lawrence. Whilst most anxious to *divert* the carrying trade *from* the Erie Canal and the Railroads of the State of New York *to* the St. Lawrence, they only indulge that river as far as Lake St. Louis, whence the trade is again to be diverted *from* it, and thrown into the lap of the city of New York, that on the way it may swell the revenues of the Champlain Canal. The St. Lawrence might be dammed at Lake St. Louis for all they seem to care. No mention made or hope expressed of the lower waters, no Gulf! no Ocean! except indeed, where with great complacency they remind us (as an argument *in favour* of their project) that "tonnage *enters inwards* at Quebec in ballast! Colonel Phillpots in 1839* was bold enough to declare "that when once the inland navigation has been so far improved as to render it possible to bring the trade of the west by this route," (the Welland and St. Lawrence) "the western merchant and farmer would find as good a market at Montreal and Quebec as at New York or elsewhere." And again, 'there can be no doubt that a very large portion of this vast trade (the western) will pass this way,—the cheapest and most convenient route to the Atlantic, and that Montreal and Quebec will become two of the greatest emporiums in North America."(!)

A more recent writer,† himself a strenuous advocate of the Champlain and St. Lawrence Canal, (for which, in one part of his essay, he claims this trade, and therefore, in some degree, damages the value of his opinion) asserts that on view of all the rival routes he "sees no reason to believe that the trade will leave the St. Lawrence for the American routes," declaring that it cannot be supposed "that the main body of western exports will leave the broad bosom of our river to climb over the table lands of New York; a respectable portion of it will exude through the Gulf of St. Lawrence."

We may smile at the enthusiasm of Col. Phillpots, but the summit of the ocean trade by the St. Lawrence has not yet been reached, and his prophetic errors may be errors only in dates:—we may reject the double reasoning of Mr. Keefer and satisfying ourselves with one of his opinions, that "the trade will exude through our Gulf," make a present of the other to the Commissioners; but we are not prepared to accept the foreign pilotage of these gentlemen, and after travelling with them (as we do heartily) from the far west to the foot of Lake St. Louis, there turn our backs on the St. Lawrence, and having just brushed, as it were, the borders of tide water, clamber with them over the green mountains in search of the seaboard!

We could have wished to have seen the Commissioners treat this project with less manifest partiality; they have put a case as advocates which they should have argued as judges, and this is the more unfortunate as they coquet with and would gilt the St. Lawrence to wed the Hudson.

The Report of the Commissioners in relation to "A Provincial Line of Ocean Steamers" is most satisfactory and unexceptionable. The contract provides for *fourteen* fortnightly summer trips from Liverpool to Quebec *and* Montreal; and *five* monthly winter trips to Portland in the State of Maine, connecting there with the Portland and Montreal Railroad. This service is to be performed by a Line of Screw Steamers of not less than 1500 tons burthen, capable of carrying 1000 tons of

* The Canal Navigation of the Canadas; by Lieut. Col. Phillpots, R. E. WEALE—London: 1840.

† The Canals of Canada; by Thomas C. Keefer. C. E. ARMOUR—Toronto: 1850.

cargo. The accommodation for passengers is to be of three classes, rates not exceeding the following fares respectively,—cabin, £21 ; 2nd cabin, £12 12 ; and steerage, £6 6s., every requisite being found, and a mail and mail officer being carried free of charge. The freight from Liverpool not to exceed 60s. per ton measurement, nor the freight of produce above that demanded by sailing vessels. For this service the contractors are to receive £24,000 sterling per annum, to which sum the St. Lawrence and Atlantic Railroad Company and the City of Portland are to contribute £5000 stg., leaving the balance (£19,000 stg.) as the annual Provincial charge.

By the Straits of Belle Isle the distance from Liverpool to Quebec is nearly 400 miles less than that to Boston, which, with smooth water from the Straits to Quebec, and vessels of equal speed, will give a saving of 2½ days in the voyage. We may, therefore, hope to establish an improved mail line for the Province, and perhaps ultimately when our Railroads shall have been completed, instead of paying for transit of our mails through the States, be enabled to make a profit on the carriage of an American Mail to the west. One great improvement resulting from the contract will be the erection of proper lighthouses throughout the Lower St. Lawrence and the Straits of Belle Isle, whereby the character of the navigation will be improved, insurances reduced, and the whole shipping interest served. We can imagine nothing more judicious than the completion of the contract and the manner of it—the realization of the enterprize and its success is fraught with advantages direct and indirect affecting every interest in the Province.

After recommending an expenditure of £30,000 on the rapids of the St. Lawrence, with the view of obtaining a safe and facile channel throughout, for vessels drawing 10 feet of water, an improvement well worth the outlay, the Commissioners proceed to consider the propriety of the construction of the proposed canal at the Sault Ste. Marie. As in the case of the Champlain Canal, however, so in this. They no sooner state the cost than they drop the subject. A survey has been made and an "ad interim" report submitted by Mr. S. Keefer, but all to no purpose—the Commissioners will not be tempted or driven to a judgment. We are glad to see that Mr. Keefer insists upon Lockage of the fullest capacity for the largest class of steamboats on our lakes. The obstacles and inconveniences, nay, we may even say, the positive losses resulting from a contrary course on other canals, prove the wisdom of at once making a permanent sufficient provision in these particulars; besides, if the estimates may be relied on, and we infer that they may, the extra expense is unworthy of consideration : for while the cost of this canal 120 feet wide, with locks 250×55×9 will be £100,000, that involved in a width of 150 feet with locks 100 feet longer, 11 feet wider, and with one foot additional draught of water, viz : 350×66×10, would only be £20,000 more, or £120,000.

In the estimate of "Prospective Revenue," we find some interesting information in connection with the Mining Companies of Lake Superior. The population now engaged *on the South side*, numbers 2500. Thirty-seven Mining Companies have been there formed, of which fifteen have commenced operations, and will produce this year (1852) about 2000 tons of copper, worth at Pittsburgh £120 per ton. Two Iron Companies (also on the *South* side) expect to produce 1000 tons of "blooms" this season (1852) which sell at Detroit for £16 5s.* per ton. "The proprietors of the Iron Mountain are sanguine in their expectations of transporting 100,000 tons (!) of this ore eastward immediately upon the opening of the canal. They expect to be able to manufacture it into railway bars at the cost of £7 10s. per ton, and thereby to revolutionize the iron trade."

This Iron has, it is said, been ascertained by experiment to possess an ultimate tenacity when rolled into bars of 89 882 lbs. upon the square inch—while that of the best Russian is but 79.000 lbs., and of the best English 57.000 lbs.;—and in its native state to contain 69 per cent. of pure Iron.

* This price must be a misprint in the Report, it does not agree well with the statement further down that the proprietors of the iron mountain expect to furnish railway bars at £7 10s. per ton.

We trust these "sanguine expectations" may be realized, and the truth of these experiments substantiated. But why so much about the operations on the *South* shore, and nothing, *positively nothing*, about those on the north? Did Mr. Keefer see too much or too little of these North shore operations?—perhaps both—perhaps he saw too much of *how little was doing*, and thought it more prudent or more charitable to give *our* companies the go-by. Strange, that in an estimate of the "Prospective Revenue" of *a Canadian Canal* at the Sault Ste. Marie, the only references made to the sources whence that revenue is to be derived, should be in connection with "*the South shore!*" Have they on the North shore no "sanguine expectations" on a large scale ? no realizations on a small one ? We were prepared to hear (whenever we heard *anything* in connection with our Superior Mines *but "calls"*) that *very little* had been done; but we are now obliged to infer, from Mr. Keefer's silence, that *nothing is expected!*

We have thus given an abstract of this important and valuable Report, venturing our own impressions in relation to such parts of it as seemed to demand comment, and if we have extended our notice to an unusual length, we rest our excuse on the public interest of the subjects, and the very great difficulty (to which we have before referred) of obtaining a copy of the document.

Improved Railroad.—Mr. Carpenter, of Rome (N. Y.) has made an improvement in the ordinary iron railroad, calculated greatly to diminish the liability, if not utterly preclude the possibility of a train running of the track, under any circumstances. The improvement consists of a middle rail of iron or wood, running the whole length of the track, precisely in its centre, and raised a foot or so above the side or bearing rails. Friction rollers are attached to the engine and cars beneath, to play upon the sides of the middle, or guiding rail, whereby the motion of each car is steadied, and any tendency to fly the track at once arrested. Experienced and competent engineers concur in the opinion that the adoption of this invention would add greatly to the safety and security of railroads, and prevent a large class of accidents to which we are now exposed. As they now are, it is left to chance and good luck whether or not we are carried safe. If nothing happens to it—if nothing is thrown upon the track, by accident or by design—if no stone or rock should happen to roll down upon it from along its numerous banks—if no limb from a tree, or a rail or stake from a fence, is blown upon it—if no animal get upon it—if no child, in its innocent sport, should place a strip of board upon it (as was recently the case in England, thereby throwing the cars off and killing five persons)—if none of these, and numerous other similar unforeseen and unavoidable casualties should occur, we may be carried along safely enough on railways as now constructed. With this improvement the speed may be increased to almost any extent, with entire safety, so far as there would be any danger of running off. In short, without it a railroad is incomplete, so much so as a ship without a rudder or a carriage without a tongue. We are informed by Mr. Carpenter that the only objection made to his improvement, is the cost of it; and yet he is fully of the opinion that it would be a matter of economy, and for the manifest interest of railway companies to adopt his improvement. It would not only prevent a large class of accidents, but it would prevent the wheels from wearing as they now do, the friction being much less.—*New York Tribune.*

Although the above paragraph has recently appeared in several of the American and English journals, yet it occurred to us that a similar improvement had been proposed in Canada several years ago, and upon enquiry we found, that in the spring of 1847, a patent was secured by Mr. Sandford Fleming, of Toronto, for a centre rail railway. Mr. F went farther than to insure the safety of the train, by guide wheels acting on the middle rail; he also proposed to have horizontal driving wheels revolving against the sides of it by which the locomotive and carriages were propelled. A model was constructed on this principle, which, we are told, elucidated the mode of propulsion satisfactorily; but it must be admitted that there are difficulties to encounter before the details of this proposed system of locomotion could be properly carried out; yet if the extra cost of an additional rail was not sufficient to preclude its adoption, the liability of trains to run off the track, would doubtless be greatly diminished, and consequently the safety of passengers and property, in the same ratio, increased.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—October, 1852.

Latitude 43 *deg.* 39.4 *min. North.* *Longitude,* 79 *deg.* 21 *min. West.* *Elevation above Lake Ontario :* 108 *feet.*

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.
						°	°	°	°												
c	1	29.856	29.851	29.861	29.862	44.9	61.4	53.8	53.4	0.282	0.388	0.343	0.339	95	73	85	84	N E b E	E b S	Calm	- -
c	2	.892	.853	.861	.873	49.2	67.8	60.6	59.6	.305	.514	.474	.432	89	78	92	86	Calm.	S E b S	Calm	Inap
cd	3	.871	.824		.	56.1	63.9			.410	.536			93	93			Calm.	S	S S W	0.350
c	4	.717	.568	.588	.613	53.1	65.2	45.4	54.9	.371	.319	.215	.298	93	53	72	71	Calm	W b S	Calm	- -
c	5	.518	.394	.324	.404	42.6	57.1	51.7	51.2	.231	.326	.289	.284	85	71	77	76	Calm	S	Calm	- -
c	6	.252	.257	.424	.319	48.2	70.5	49.8	57.2	.277	.291	.281	.295	84	40	80	67	Calm	W b S	Calm	Inap
ac	7	.440	.409	.374	.410	45.7	59.6	57.1	54.6	.273	.431	.407	.373	90	86	89	88	Calm.	E b N	N E b E	0.700
b	8	.428	.567	.676	.559	55.6	61.0	51.5	56.7	.403	.374	.364	.394	93	71	97	88	N E b N	N W b N	E N E	0.220
b	9	.516	.340	.215	.347	49.5	54.6	55.6	53.2	.341	.396	.413	.381	97	94	96	95	E	E b N	E S E	1.450
b	10	226	.353		.	59.1	63.9			.468	.462			95	80			S	W b N	W N W	Inap
b	11	.700	.678	.564	.644	42.8	56.4	49.9	49.8	.255	.282	.289	.239	94	63	81	82	Calm	S E b S	Calm	- -
c	12	.385	.635	.743	.603	51.1	52.6	35.7	47.5	.351	.377	.158	.311	96	97	75	91	Calm.	W b N	Calm	- -
a	13	.824	.769	.723	.771	34.1	49.2	37.8	41.1	.190	.329	.207	.228	97	95	92	89	N W	W b N	Calm	- -
a	14	.633	.539	.559	.567	37.8	50.7	42.4	43.6	.213	.325	.226	.255	95	89	84	90	N E b N	Calm	N W b N	0.020
ac	15	.598	.654	.734	.672	38.8	43.4	34.1	38.9	.189	.136	.158	.158	81	49	79	68	W N W	N W b N	N W b N	- -
ac	16	.836	.884	.877	.875	30.9	44.7	34.5	36.6	.158	.200	.165	.173	92	69	82	81	N W b N	W	Calm	0.005
e	17	.804	.580			39.1	54.5			.228	.304			96	73			S	S S W	N E	Inap
c	18	.453	.141	.333	.337	49.2	64.3	52.0	55.2	.320	.449	.263	.321	93	77	69	75	E b N	S W b W	W b N	- -
c	19	.767	.863	.898	.850	43.4	51.8	37.3	43.4	.230	.223	.205	.219	83	59	93	79	N N W	N N W	Calm	- -
e	20	.903	.848	.779	.839	32.2	49.6	42.0	41.9	.177	.261	.247	.229	97	75	93	86	N E b N	E b S	Calm	Inap
c	21	.733	.631	.566	.638	39.5	54.9	48.5	48.4	.236	.342	.290	.296	98	80	86	88	Calm	E b S	N b E	0.155
a	22	.641	.758	.845	.764	45.8	48.9	39.1	45.1	.289	.249	.208	.233	95	73	88	79	N W b N	N b W	Calm	- -
ab	23	.903	.857	.793	.832	35.5	48.8	35.2	40.2	.161	.250	.185	.202	78	74	91	81	N	S b E	S b W	- -
ba	24	.730	.561			29.8	57.1			.141	.333			85	74			N b E	S b W	Calm	Inap
a	25	.655	.693	.929	.775	41.6	56.7	39.6	45.1	.218	.307	.176	.230	84	68	73	76	N N W	N b E	N N E	- -
e	26	30.040	30.042	.953	30.018	33.0	41.0	44.0	39.1	.149	.174	.201	.167	79	68	70	70	N E	E	E	- -
c	27	29.848	29.794	.763	29.798	40.6	49.2	50.7	47.3	.213	.318	.347	.298	85	92	95	90	E b S	E b S	E S E	0.120
ac	28	.731	.711	.657	.687	52.4	57.1	49.3	52.6	.358	.443	.256	.347	93	97	74	88	Calm	S S W	N b W	0.240
cd	29	.674	.655	.536	.622	49.7	46.6	46.7	47.5	.320	.290	.283	.294	91	92	90	90	N E	E N E	E b N	1.825
c	30	.459	.423	.481	.450	46.0	47.9	46.3	46.4	.283	.308	.296	.291	92	94	95	93	E b N	N N E	E b S	0.190
e	31	.464	.435			46.0	51.3			.287	.302			94	81			E S E	S S W	Calm	0·005
	M	29.669	29.647	29.658	29.659	43.58	54.27	45.79	48.09	0.261	0.319	0.267	0282.	90	76	85	83	Ml's 3.10	Ml's 6.34	Ml's 3.00	5.280

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1379.66	1071.35	497.96	1146.51

Mean velocity of the wind - - 4.47 miles per hour.
Maximum velocity - - - - - - 18.9 ml's per h'r, from S to 9 p.m. on 18th.
Most windy day - - - - - - 29th : Mean velocity, 10.52 miles per hour.
Least windy day - - - - - - 2nd : Mean velocity, 0.83 ditto.
Most windy hour - - - - - - noon: Mean velocity, 6.58 ditto.
Least windy hour - - - - - - 10, p.m. Mean velocity, 3.00 ditto.
Mean diurnal variation - - - 3.58 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Thunder Storms.—7th, thunder storm, and rain, from 5 to 7 P.M.

Highest Barometer - - 30.140, at 8 A.M., on 26th } Monthly range :
Lowest Barometer - - 29.138, at 1 P.M., on 18th } 1.002 inches.

Highest observed Temp. - 70.7, at 2 P. M., on 6th } Monthly range :
Lowest regist'd Temp. - 23.8, at A.M., on 13th } 46.9
Mean Highest observed Temperature - - 55.50 } Mean daily range :
Mean Registered Minimum - - - - - 39.80 } 15.69
Greatest daily range - - - - - 26.5 from 4 P.M., on 6th, to A.M., on 7th.
Warmest day - - 2nd - - - Mean Temperature - 59.57 } Difference :
Coldest day - - - 16th - - - Mean Temperature - 36.58 } 22.99
12th, 8h. 23m., P.M., Brilliant Meteor in S.—time of flight fully 2s.

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for October.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Wind. Mean Velocity.	Snow. D's	Inch's
	°	°	°	°			Miles.		
1840	44.44	68.5	23.9	44.6	13	1.860	--	3	not regis'd
1841	41.47	58.3	20.3	38.0	6	1.360	--	2	
1842	44.84	68.5	30.0	38.5	8	5.175	--	0	
1843	41.57	65.7	24.5	41.2	12	3.790	--	4	2.5
1844	43.24	69.6	17.8	51.8	7	1.245	--	4	12.0
1845	46.16	62.7	20.0	42.7	11	1.760	--	1	Inapp
1846	44.63	69.7	20.7	49.0	14	4.180	--	2	Inapp
1847	44.08	65.0	20.3	44.7	13	4.390	--	2	Inape
1848	46.69	66.2	26.4	35.8	11	1.550	4.60	0	Non
1849	45.28	59.2	25.5	33.7	13	5.965	4.66	1	Inapp
1850	45.44	66.6	24.8	41.8	10	2.085	5.30	0	None
1851	47.83	66.1	25.0	41.1	10	1.680	4.39	2	0.3
1852	48.09	70.7	29.8	40.9	12	5.280	4.47	0	None
M'n	44.90	65.60	23.77	41.83	10.8	3.101	4.70	1.6	1.48

SCIENTIFIC INTELLIGENCE.

New Species of Orang.—At a meeting of the Academy of Sciences of Philadelphia on the 3rd of February, a very interesting communication was read from Dr. H. A. Ford, dated Glasstown, Gaboon River, West Africa, respecting the characteristics of a peculiar species of Orang, the Troglodytes Gorilla, which appears to have been first noticed by Bowditch in 1817, and first described by Savage and Wyman in 1847.

The animal inhabits the range of mountains that traverses the interior of Guinea, from the Cameroons on the north to Angola on the south, and about 100 miles inland, the exact limits to which it extends have not been very accurately determined. Formerly, the animals were found only about the sources of the rivers, but lately they have descended to within a few miles of the coast, a fact which may probably account for the little that is yet known respecting them.

The name given by the natives is Ngena, when young he is black like the Troglodytes niger, but when adult of an iron grey colour, owing to the hair next the skin being white ; some are entirely white, probably from age.

The hair is of great length and thickness, and from this circumstance, together with the enormous thickness of the skin, the brute appears of an enormous size. The specimen examined, by no means a large one, measured three and a half feet across the shoulders. On the head the

animal possesses a kind of crest, increasing in height from before backwards, and formed principally of a thickness in the scalp. This crest the animal draws forward when enraged, increasing his naturally hideous appearance, which is rendered still more horrible by the lower lip consisting of a huge muscular flap, very distensible and dropt over the chin in moments of anger.

The muscles of the neck, arms, thighs and trunk are enormously developed; the wrist was one foot in circumference. The specimen examined, the skeleton of which was presented to the Academy, had been eviscerated before it was brought to Dr. Ford, but even thus it weighed one hundred and eighty pounds, from which some idea may be formed of the enormous size of the animal. The arms are proportionately longer than in the Chimpanzie.

The Ngena is represented as the most terrible monster of his native forests, an idea which his hideous appearance and implacable enmity to man sufficiently justifies. The moment that he scents a man he prepares for the attack, and acts on the offensive. With crest erect and projecting forward, nostrils dilated and under lip thrown down, uttering his peculiar cry, which is more of a grunt than a growl, he rushes on his antagonist, and unless disabled by a well directed shot, generally succeeds in dashing him to the ground and tearing him to pieces with his tusks.

He is said to seize a musket and instantly crush the barrel between his teeth.

His natural enemy seems to be the leopard, with whom he wages a not always successful warfare. Young specimens have exhibited such an implacable disposition as to resist the most persevering efforts at taming them.

The flesh is by some tribes considered as delicate eating; he feeds on roots and fruits, but is evidently to some extent carnivorous.

The height of the mounted skeleton is four feet nine inches.

Proceedings of the Academy of Sciences of Philadelphia, Feb. 1852.

Human Footprints in Solid Limestone.—At a meeting of the Academy of Natural Sciences of Philadelphia on 1st June, Mr. Lea called attention to the stone slabs containing supposed imprints of human feet, deposited by him in the museum that evening. This slab is from the limestone formation immediately under-lying the coal near Alton, Illinois. The impressions have evidently been sculptured, and bear the marks of some blunt instrument with which they have been executed, Mr. Lea observed that those are not the first instances of this kind which have been noticed, and referred to a description of a similar slab published in Silliman's Journal several years since.

Dr. Owen stated that the slab of limestone alluded to by Mr. Lea, as found on the Mississippi near St. Louis, is the same which is now preserved in his (Dr. Owen's) collection, and on which two articles have appeared in Silliman's Journal; one by Mr. Schoolcraft and one by himself. Dr. Owen in that paper gave it as his opinion that these feet marks were carved on the rock by the aborigines.

Since that article appeared, Dr. Owen had obtained the most satisfactory corroboration of this inference in two large slabs of magnesian limestone of lower Silurian date, obtained at Moccasin-track Prairie in Missouri, which slabs contained a great many carvings of human feet, as well as those of animals, and rude imitations of the human form, something like figures made in gingerbread. The foot marks bear indubitable tool marks, and some are deficient in the true number of toes, while in others the foot is distorted, with the little toe standing out almost at right angles.

These specimens, as well as that of Mr. Lea's, show clearly that the aborigines of Missouri had the same propensity for carving the imprint of feet as the Southern and Western aborigines of this continent had for representing the hand on the walls of the ancient edifices, and other situations.

Any one acquainted with Indians knows that there is no subject which they study more closely than all kinds of tracks; in fact their life, their maintenance and their whole security depend upon an intimate and cunning knowlege of podology.

Proceedings of the Academy, June, 1852.

Extracts from the Proceedings of the British Association at Belfast, September, 1852.

1st.—'Anastatic Printing,' by S. Bateson, Esquire.—"The term 'Anastatic' means raising up, or a reproducing as it were, and very significantly does the name express the result; for by it any number—thousands upon thousands—of reproductions of any printed document may be obtained, each of which is a perfect *fac simile* of the original, no matter how elaborate the engraving may be, or how intricate the design. I will now endeavour to describe the actual operation of Anastatic printing. The print of which an Anastatic copy is required is first moistened with very dilute nitric acid (one part of acid to seven of water,) and then being placed between bibulous paper, all superabundance of moisture is removed. The acid being an aqueous solution, will not have attached itself to the ink on the paper, printers' ink being of an oily nature; and if the paper thus prepared be placed on a polished sheet of zinc and subjected to pressure, two results follow:—In the first place, the printed portion will leave a set-off or impression on the zinc; and secondly, the nitric acid attached to the non-printed parts of the paper will eat away and corrode the zinc, converting the whole, in fact, into a very shallow stereotype. The original being removed (perfectly uninjured,) the whole zinc plate should next be smeared with gum water, which will not stick to the printed or oily part, but will attach itself to every other portion of the plate. A charge of printers' ink being now applied, this in its turn only attaches itself to the set-off obtained from the print. The final process consists in pouring over the plate a solution of phosphorous acid, which etches or corrodes more deeply the non-printed portion of the zinc, and produces a surface to which printers' ink will not attach. The process is now complete, and from such a prepared zinc plate any number of impressions may be struck off.—The uses to which this invention may be applied are various—copies of rare prints may be obtained without the aid of an engraver. Reproductions of books, or of works out of print, may be had without setting up the type, authors may illustrate their own works, and amateur artists may have fac-similes of pen-and-ink sketches at a very inconsiderable expense.

2nd.—'On the Koh-i-noor Diamond,' by Prof. Tennant.—At the last meeting of the British Association, Dr. Beke read a paper 'On the Diamond Slab supposed to have been cut from the Koh-i-noor.' He stated:—"At the capture of Coochan there was found among the jewels of the harem of Reeza Kooli Khan, the chief of that place, a large diamond slab, supposed to have been cut from one side of the Koh-i-noor, the great Indian diamond now in the possession of Her Majesty. It weighed about 130 carats, showed the marks of cutting on the flat and largest side, and appeared to correspond in size with the Koh-i-noor." Prof. Tennant was induced to record his opinion of the probability of this being correct. He had made models in flour spar, and afterwards broken them, and obtained specimens which would correspond in cleavage, weight, and size with the Koh-i-noor. By this means he was enabled to include the piece described by Dr. Beke, and probably the large Russian diamond, as forming altogether but portions of one large diamond. The diamond belongs to the tesselar crystalline system: it yields readily to cleavage in four directions, parallel to the planes of the regular octahedron. Two of the largest planes of the Koh-i-noor, when exhibited in the Crystal Palace, were cleavage planes,—one of them had not been polished. This proved the specimen to be not a third of the weight of the original crystal, which he believed to have been a rhombic dodecahedron; and if slightly elongated, which is a common form of the diamond, would agree with Tavernier's description of it bearing some resemblance to an egg.—Sir D. Brewster made some observations, and stated that the English translation of Tavernier's work left out the minute details which were fully given in the original. Sir David expressed his satisfaction with Mr. Tennant's illustration,—which clearly proved the diamond to be only a small part of a very large and fine stone.

3rd.—'Notice of a Tree struck by Lightning in Clandeboye Park,' by Sir David Brewster.—The tree stood in a thick mass of wood, and was not the tallest of the group. The lightning bolt struck it laterally about 15 feet above the ground, exactly at the cleft where the two principal branches of the tree rose from the trunk. A large part of the bark and a piece of the solid wood were driven to some distance, and the electric fluid passed down the trunk into the ground, splitting the tree in two by a rent through the whole of its thickness. The fact contained in this notice, that an object may be struck by lightning in a locality where there are numerous conducting points more elevated than itself, shows that a lightning bolt cannot be diverted from its course by conductors, and that the protection of buildings from this species of meteor can only be effected by conductors stretching out in all directions.

4th.—'On the Aurora Borealis,' by Admiral Sir John Ross.—This was the theory of auroras originally explained by Sir John Ross at the Dublin Meeting in 1835. He gives the opinion of Schumacher in favour of his theory, and of Arago against it; and asserts that Messrs. Gaineaud, Martins and another were sent to Hammerfest in 1842 to test its accuracy, and returned impressed with the correctness of his views.

5th.—'On the Aurora,' by Lieut. W.H.H.Hooper.—This is a theory pretty nearly the same as that of Admiral Sir John Ross. The author says: "I believe the aurora borealis to be nor more nor less than moisture in some shape (whether dew or vapour, liquid or frozen,) illumined by the heavenly bodies, either directly or reflecting their rays from the frozen masses around the pole, or even from the immediate proximate snow-clad earth." This opinion he supports by facts and argument.

6th. 'On the Re-concentration of the Mechanical or Energy of the Universe,' by W. J. M. Rankine.—Mr. Rankine observed that—It has long been conjectured, and is now being established by experiment,

that all forms of physical energy, whether visible motion, heat, light, magnetism, electricity, chemical action, or other forms not yet understood, are mutually convertible; that the total amount of physical energy in the universe is unchangeable, and varies merely its condition and locality, by conversion from one form to another, or by transference from one portion of matter to another. Prof. W. Thomson has pointed out, that in the present condition of the known world there is a preponderating tendency to the conversion of all other forms of energy into heat, and to the equable diffusion of all heat; a tendency which seems to lead towards the cessation of all phenomena, except stellar motions. The author of the present paper points out that all heat tends ultimately to assume the radiant form; and that, if the medium which surrounds the stars and transmits radiation between them be supposed to have bounds encircling the visible world, beyond which is empty space, then at these bounds the radiant heat will be totally reflected, and will ultimately be re-concentrated into foci; at one of which if an extinct star arrives, it will be resolved into its elements, and a store of energy re-produced.

7th. 'On the Causes of the Excess of the Mean Temperature of Rivers above that of the Atmosphere, recently observed by M. Renou,' by W. J. M. Rankine.—M. Renou having for four years observed the temperature of the River Loire, at Vendome, as compared with that of the atmosphere, has found, that the mean temperature of the river invariably exceeds that of the air, by an amount varying from 1¼ to 3 centigrade degrees, and averaging 2°.24 centigrade, and a similar result has been deduced from observations made by M. Oscar Valin on the Loire at Tours. M. Renou and M. Babinet account for this fact by the re-radiation of the bed of the river of solar heat previously absorbed by it. Mr. Rankine thinks this supposition inadequate to account for the facts; because the excess of temperature of the river over the air was considerably above its mean amount in November, and very near its maximum in December; and because the mean diurnal variation of temperature of the river was much less than that of the air. He considers that friction is more probably the principal cause of this elevation of temperature; for if water descends in an uniform channel, with an uniform velocity, from a higher level to a lower, the whole power due to its descent is expended in overcoming friction; that is to say, is converted into heat, as the experiments of Mr. Joule have proved. This must cause an elevation of temperature, which will go on until the loss of heat by radiation, conduction, and evaporation, balances the gain by friction, and at this point the temperature of the river will remain stationary.

8th. 'On Graphite Batteries,' by Mr. C. V. Walker.—After referring to the unfitness of copper, and the too great cost of the superior metals for the purpose of batteries, Mr. Walker said he had early sought a substitute for both purposes, and had found one which seemed to promise all that was required in the deposite of carbon from gas, or graphite.

The Planet of August 22nd, 1852.

To the Editor of the London Times:

Sir,—Having been deputed by Mr. Bishop to find a name for the Planet which I discovered on the 22nd of August, I propose to call it "Fortuna." The following elements of the planet's orbit have been calculated by Mr. Vogel, assistant at this observatory. In addition to our own observations, other taken at the Royal Observatory, Greenwich, and at Cambridge by Professor Challis, have been used in the computations:—

	Deg.	Min.	Sec.
Mean anomaly, counted from the perihelion, 1852, September 10, at Greenwich, noon	321	13	12
Longitude of the perihelion	30	23	29
Longitude of the ascending node	211	35	25
Inclination of the orbit	1	32	13

Eccentricity, 0.157564.
Mean distance from the sun, 2.44093.
Period of revolution, 1.393 days.

This orbit is remarkable for its small inclination to the earth's path.

I remain, Sir, your most obedient servant,

J. R. HIND.

Mr. Bishop's Observatory, Regent's Park, Oct. 5.

MISCELLANEOUS INTELLIGENCE.

The British Post Office.—In the year 1839, under the old system, 75,907,572 letters were delivered, and 6,563,024 franks. In 1840, under the new system, 168,768,344; in 1841, 196,500,191; in 1842, 208,434,451; in 1843, 220,450,306; in 1844, 242,091,684; in 1845, 271,410,789; in 1846, 299,586,762; in 1847, 322,146,243; in 1848, 328,830,184; in 1849, 337,399,199; in 1850, 347,069,071; in 1851, 360,647,187. The net revenue in each of the above years, ending the 5th of January, including the charges on the Government departments, has been—1839, under the old system, £1,659,509; 1840, including one month of the fourpenny rate, £1,633,764; 1841, under the new system, £500,789; 1842, £561,249; 1843, £600,641; 1844, £640,217; 1845, £719,957; 1846, £761,982; 1847, £825,112; 1848, £984,496; 1849, £740,429; 1850, £840,787; 1851, £803,898; 1852, £1,118,004.

Public Revenue and Expenditure of Great Britain.—The state of the public revenue and expenditure from the year 1822 to 1851, inclusive, may be seen at a glance by reference to a return, printed by order of the House of Commons. By it, it appears that in 1822 the total revenue, after deducting drawbacks and repayments, was £59,823,835, and the expenditure £55,079,316, leaving a surplus income of £4,744,518. In 1824 the revenue exceeded that of 1822 by the sum of £5857, but the expenditure was nearly £1,000,000 more. From 1824 the public income gradually declined, until in 1835 it fell to £50,408,579, showing a deficiency, as compared with 1824, of no less than £9,421,112. The expenditure, however, in 1835, was the lowest during the last 30 years, the amount being only £48,787,633 while there was a surplus income of £1,620,092. The revenue and expenditure have steadily increased since 1835, until in 1851 the revenue reached £56,729,390, and the expenditure amounted to £54,002,994, leaving a surplus of £2,726,396. In the 30 years from 1822 to 1851, inclusive, there was a surplus in 19 years, and a deficiency in 11 years. The years in which the expenditure exceeded the income of the country were 1827, 1828, and 1832, from 1837 to 1843 both inclusive, and in 1847 and 1848. The surplus revenue since 1822 exceeded £50,900,009, while the deficiencies did not amount to more than £16,000,000.

Religious Census of Upper Canada.—The following is a return of the religious census of Upper Canada, as taken under the authority of law, in the years 1842, 1848, and 1852:—

	1842.	1848.	1852.
Church of England	128,897	166,340	223,928
Methodists (all)	99,343	137,752	208,611
Presbyterians (all)	115,120	148,182	204,622
Church of Rome	78,119	119,810	167,930
Baptists	19,662	28,053	45,457
Lutherans	...	7,186	12,085
Congregationalists	5,095	5,993	7,931
Quakers	6,230	5,951	7,497
Universalists	...	2,196	2,688
Unitarians	...	678	833
Not classed	23,582	78,461	70,471
Totals	486,055	723,332	952,005

The following are the returns, according to the places of nativity:—

Natives of Upper Canada	523,357
Natives of Ireland	177,055
Natives of England	82,482
Natives of Scotland	75,700
Natives of the Untied States	43,360
French Canadians	26,500
Natives of Germany	9,721
All other countries	13,760
Total	952,005

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the Improvement in Art, and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, DECEMBER, 1852.

CONTENTS:

PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

INCORPORATED BY ROYAL CHARTER.

Annual General Meeting, December 11th, 1852.

The Annual Meeting of the Canadian Institute was held in the old Government House on Saturday, December 11th. The spacious and commodious apartments in that building which have been placed at the disposal of the Institute by the Government, are more convenient and accessible than the Hall of Assembly and the adjoining rooms, which were alluded to in the November number of the *Journal*. The discussion of the Report of the Council, and the election of officers and members constituted the business of the evening. In the absence of the 1st and 2nd Vice Presidents, George Duggan, Esq., junr., was called to the chair, and the Report being read, it was adopted after the introduction of a few unimportant amendments. The Report speaks for itself, and we give it at length, in order that absent members may have an opportunity of satisfying themselves with respect to the progress of the Institute. The list of candidates for membership proposed at the last meeting was then read and the gentlemen elected members of the Institute. In addition to the names which we inserted in the October number of the *Journal*, we have now to announce the names of several other gentlemen who were proposed on Saturday, and the formality of whose election will be completed at the next meeting of the Institute. *Life Members*—John Hutchinson, George Herrick, M. D., James Cotton; *Ordinary Members*—H. S. Fripp, T. Hirschfelder. The Election of Officers was then proceeded with, which terminated as follows:—

President:
Capt. J. H. Lefroy, R.A., F.R.S.

First Vice President—Professor Cherriman.
Second Vice President—Fred. Cumberland, Esq.
Treasurer—Dalrymple Crawford, Esq.
Corresponding Secretary—Professor Croft.
Secretary—Alfred Brunel, Esq.
Curator and Librarian—Edward Cull, Esq.

Council:

Professor Hind,	Professor Buckland,
Walter Shanley, Esq.,	Rev. Professor Irving,
Sandford Fleming, Esq.,	Dr. Bovell.

Annual Report of the Council of the Canadian Institute for the year 1852.

The present Council having taken office shortly before the close of the last session of the Institute, have little more to report than their own proceedings in carrying out the objects of the Society during the recess.

In the short period which intervened between their appointment and the close of the session only four papers were read, viz.:

1. On Concrete, by Mr. Cumberland,

2. On Limestones, by Mr. Thomas.

3. On Auroras, by Capt. Lefroy.

4. On the Probable Numbers of the Indian Races Inhabiting British America, by Capt. Lefroy.

Each of the above papers, however, led to such discussion as it is the wish and the object of the Institute to elicit.

During the above mentioned short period a considerable number of new members joined the Institute, and the Council have the further pleasure of submitting a list of sixty-three candidates, the formalities of whose election could not be completed during the recess, but whose names will be brought before the meeting this evening in accordance with the by-laws of the Institute, The number of members previously on the books was one hundred and twenty-six, making in all one hundred and eighty-nine.

Among the first objects to which the attention of the Council was directed, was the provision of some means for the regular and speedy publication of the papers read before the Society subject to such regulations as might be necessary to sustain the character of its transactions. Experience appears to show that it is only by offering facilities of this nature that literary and scientific societies can for any length of time either engage the interest of the community, succeed in calling forth exertions from their members, or secure to themselves the advantage of hearing papers of permanent value read before their meetings.

As it was impossible in the infancy of the Society to sustain a regular publication by its own funds, the method was adopted after much consideration of originating a monthly periodical, which, while claiming public support upon independent grounds, should also be under the control of the Council to a sufficient extent to secure the attainment of their objects. Such is the *Canadian Journal*, which, under the editorship of Professor H. Y. Hind, to whose able and gratuitous services the Institute is most deeply indebted, has now reached its fourth number, and has been recognized in flattering terms by most of the organs of public opinion throughout the Province.

In order, still further, to extend the usefulness and increase the interest of the *Journal*, proposals have been made to the Natural History Society of Montreal, and to the Literary and Historical Society of Quebec with the view of rendering the *Canadian Journal* the organ for the publication of their proceedings. It

is also proposed to make similar applications to all the Mechanics' Institutes throughout the Province.

The want of information respecting the water levels of Lake Ontario, which are variable to such an extent as seriously to affect the interests of navigation and manufacture, and greatly to embarrass the operations of engineers who, as yet, have had no standard lake-level upon which to establish their investigations, induced the Council to make enquiry of the Commissioners of Public Works as to any existing records of the levels of past years, and to suggest the propriety of establishing a future reliable system of observation and registration at various points on the lake shore. The Commissioners, however, whilst they acknowledged the importance of the proposed investigation, and referred to some special observations which had been made in connection with the construction of the Provincial canals, were not prepared to recommend the Government to take any action in the matter further than to place the services of light-house keepers in its employment at the disposal of the Institute in the pursuit of such enquiry. Such assistance would very greatly facilitate the attainment of the object in view, and the Council submit for your approval the expediency of arranging during the ensuing winter, a regular system of observation, believing that it would be productive of results very valuable to the public, and thereby justifying the expenditure of a portion of the public grant.

The Council also distributed circulars throughout the Province, requesting information respecting two subjects, the one interesting on account of its connection with the former history of the country, and the other of great value from its economic importance. The circulars respecting Indian Remains and Canadian Limestones, printed in full in the second number of the *Journal*, have been widely disseminated, and the Council are happy to state that favourable results are beginning to arise from the course adopted.

It affords the highest satisfaction to the Council to be enabled to announce that there is every probability of the early co-operation of the Society of Arts of London with the Institute in the pursuit of their mutual objects. By a correspondence which has been opened with the Institute by that Society, (under the authority of Her Majesty's Secretary of State for the Colonies, and by recommendation of His Excellency the Governor General) the Council have reason to hope that the foundation has been laid for reciprocal services of a nature which will tend "to advance the knowledge of the resources and capabilities of this Province in England, and will ensure to its inhabitants such information as the Society of Arts are enabled to furnish on subjects connected with Arts, Manufactures and Commerce." The Council being impressed with the conviction that such a co-operation will result most advantageously to the Institute, strongly recommend that it be diligently pursued; and would further suggest that so soon as the Institute shall have been brought into full and efficient action, correspondence having a like bearing, be opened with other kindred Societies in Great Britain and the United States; whose liberality in extending advice and aid to less advanced Institutions, has already been amply illustrated.

The Council have already received assurance of assistance and co-operation from the Smithsonian Institute at Washington, a copy of whose valuable transactions will also be presented to the Library of the Society.

The Council have great pleasure in announcing that the Provincial Government has not only made the liberal grant of £250 to the Institute, for the current Parliamentary year, but has also sanctioned its occupation of spacious and convenient apartments in the Old Government House, and thus afforded it every facility and accommodation for an immediate commencement of a Museum and Library.

In reference to the first of these objects, there is reason to believe that a plan is in contemplation by the Government for the formation of a general museum, which, however, in the opinion of the Council, by no means supersedes the necessity of forming a more private and special collection connected with the Institute. Such a museum need not be of so extended and various a nature as that contemplated by the Government. and might, perhaps, with propriety be confined to the products of the Province, and the illustration of those Arts and Sciences which are more especially the objects of the Institution. A private collection of this kind, freely at the use of the members, will naturally be more ac-ceptable and more easily available than any large Public Museum.

In furtherance of this view, the Council would recommend:

1stly. That immediate formal application be made to the Government, for any Geological and Mineralogical specimens belonging to the Survey, of which they may possess duplicates.

2ndly. That circulars be sent to all members of the Institute, requesting their co-operation in the formation of a museum, by the donation of such specimens as they may be able to procure.

3rdly. That special application be made to Engineers and Surveyors, engaged on Railroads or mining operations for specimens obtained in cuttings or excavations, over which they may have superintendence, special attention being paid to Geological sections.

4thly. That such collection shall for the present comprehend all objects connected with Architecture and Engineering, Natural History and Botany, Mineralogy and Geology, Indian Antiquities, and Arts and Manufactures.

5thly. That a Museum Committee be appointed to act in conjunction with the Curator.

With reference to the Library the Council recommend that a liberal appropriation be made by their successors in office, towards the formation of such a Library of reference as will facilitate, assist and encourage the special pursuits of all classes of the members of the Institute. That standard works on practical Engineering, Architecture, Manufactures, Transactions of learned

Societies, and other similar series, such as are seldom met with in this country in private hands, be first provided, and that no expense be at present incurred in forming a Miscellaneous Library.

This Council would also recommend that application be made to Government for copies of all public documents printed by authority of Parliament, on the subject of Engineering, Architecture, Railways, Statistics, Prison Discipline, &c.

The Council have to report that they have entered into a correspondence with the Toronto Athenæum, with a view to an amalgamation of the two Societies, on terms expressed in a document to be presently laid before the meeting.

The Council have also gratefully to acknowledge the receipt of a considerable number of donations to the Institute, comprising a few books, geological reports, and meteorological observations, various mineralogical and geological specimens, some interesting Indian remains, several valuable maps, and models of the Toronto Harbour and of a locomotive.

The experience of the past year has shown, as must naturally be the case with all young societies, that the By-Laws and Regulations as at first framed, require more or less modifications. Some propositions relating to changes in the terms of subscription, and other desirable alterations will presently be brought before the meeting.

In concluding this Report, and retiring from Office, your Council cannot refrain from congratulating the Institute on the hopeful prospects that lie before it. The large and continually increasing list of members, the reasonable expectations of an assured and sufficient income, the probable incorporation with us of other societies, the establishment and successful issue of a Journal which bids fair to become the recognized organ of scientific intelligence throughout the Canadas; all these facts encourage the belief that the Society, though yet in its infancy, will soon extend its influence and usefulness to every part of the Province, and will ultimately take rank worthily among the great national societies of the world. But in order to realize this expectation, your Council would beg to urge upon the members individually, the necessity of personal exertion, each in his own department; not only in promoting the formation of a Museum and Library, but more especially with reference to papers to be read before the Society, and the discussions that may ensue thereon. The opportunity of publication now afforded by the Canadian Journal, while it offers additional inducement for the preparation of such papers, at the same time calls for judicious selection of subjects, and increased zeal in their investigation.

Subjoined will be found a statement showing the present condition of the financial affairs of the Institute.

Balance Sheet, *showing the Financial state of the Institute.*

		£	s.	d.			£	s.	d.
Dec'br. 1.	To outstanding acc'nt per Voucher, No. 15	3	9	11	Dec'br. 1.	By Balance in Treasurer's hands as per his account current	37	10	0
	" do. do, do. " 16	8	0	5		" Amount of uncollected subscriptions per statement No. 9	36	15	0
	" do. do. do. " 17	53	8	5		" Amount of Agricultural Association's subscription to Journal	30	0	0
	" do. do. do. " 18	1	15	0		" Parliamentary Grant now due to Institute	250	0	0
	" do. do. do. " 19	12	5	0		" Amount due for unpaid subscriptions to Journal	3	18	9
	" do. do. do. " 20	7	14	0					
	" Balance in favour of Institute	271	11	0					
		358	3	9			358	3	9
						By balance brought down	271	11	9

The Canadian Journal.

TORONTO, DECEMBER, 1852.

The Railroads of Canada.

The Legislation of the recent Session of the Provincial Parliament has been remarkable for the number of Charters granted to Railway Incorporations, and for the amendments granted to existing Companies.

The Atlantic and St. Lawrence Railway Act has been amended. This road is now under construction to the Province line, and will there connect with the Railroad to Portland, in Maine, thus connecting the City of Montreal with the Atlantic seaboard by the nearest possible route, and at the same time affording by existing Railroads, or in progress, access to the New England States, and to the Sister Provinces. The length of the St. Lawrence and Atlantic road, from Montreal to the Province line, will be about 126 miles, of which 95 miles, to Sherbrooke, are constructed and in working order, the remaining portion is being pushed forward vigorously, and it is expected it will be completed during the ensuing summer, as well as that part of the line which lies in the State of Maine.

Another Act authorises the Montreal and New York Railroad Company to extend their road, and to acquire the necessary land for such extension. This road connects Montreal (via the Lachine Railroad and Ferry, to Caughnawaga,) with the Ogdensburgh road of New York, and extends southward to Plattsburgh, by it the time of travel between Montreal and the western part of the Province is materially reduced and another channel opened to the business of New York. It has already been opened for travel in connexion with the Ogdensburgh road, but we have no information as to the direction which its extension is to take.

The next, though not precisely a Railway Act, is passed "in order to enable the Town of Dundas to grant its security to the

Great Western Railroad on behalf of the Desjardines Canal Company, for certain improvements in said Canal." Such "improvements" were rendered necessary, in fact unavoidable, by the unsuccessful attempts of the Great Western Company to construct a bridge across the present Canal, at the Burlington Heights, where, after expending a large amount of money, it was found advisable to abandon the works and change the course of the Canal—this change is considered, to a certain extent, an improvement of that navigation.

"An Act to incorporate the Main Trunk Railway of Canada," is the most important Railway Act of the session, and demands more extended notice than we are now prepared to give it. The Company will be entitled to the Government guarantee of £3,000 sterling, per mile. With the political movements which accompanied its passage through the Legislature, we have nothing to do—but we may be permitted to express our satisfaction at the fair prospects opened by it for the early construction of a main line of communication through the whole length of Canada, and our hope that its final location will be determined, as well with a view to the economical construction and subsequent working of the road, as to conserve the broadest interests of the whole Province. At present, we believe, no more is known in reference to its route than that it is intended to extend from Montreal to Kingston, and thence to Toronto—below Montreal the Atlantic and St. Lawrence road, as far as Richmond, already in operation, and the Richmond and Quebec road, now under construction, will connect the Main Trunk with Quebec—below Quebec the Trois Pistoles road will carry it on to that point, and thence it is expected a road will be constructed to Miramichi, thus uniting with the roads projected and in progress in Nova Scotia and New Brunswick.

Westward of Toronto, the Toronto and Guelph road, now under contract as far as Guelph, and its recently chartered extension to Port Sarnia, will connect the Main Trunk with the waters of Lake Huron, at the head of the river St. Clair, and with the most fertile region of the Canadian Peninsula; beyond that point a short road in Michigan, (we believe now under construction to Port Huron, immediately opposite and within one-fourth of a mile of Port Sarnia,) will connect through Detroit, and by the Michigan Central Railroad, with Chicago and all the roads west and south-west of that point. From Port Huron, another road, partly constructed, extends through the heart of Michigan to Grand Haven, opposite Milwaukie, while Port Sarnia being at the foot of Lake Huron, will command a large portion of the north-western trade, borne over Lakes Michigan and Huron. The importance of such a chain of communication through the Provinces and extending into the adjoining Republic can hardly be over-rated, and the connexion which the Main Trunk has with the lines we have named, can not fail to make it a profitable speculation. These are not, however, all the sources from which it will derive support. It will be connected by a line from Toronto to Hamilton, with the *Great Western* road, which also connects via Detroit with most of the lines above named westward of that point, and though the larger portion of the Great Western's Trade may reasonably be expected to pass over its extension to the Niagara Frontier into the adjoining State—still it must, to a certain extent, be a feeder to the Grand Trunk. Many branch roads will doubtless be constructed, stretching into the interior of the country, of which some are already projected, and will become valuable contributors to the trade of the Main Line.

The distances from Trois Pistoles to Detroit, by this system of roads, will be nearly as follow:—

Trois Pistoles to Quebec, say	145 miles.
Quebec to Richmond	90
Richmond to Montreal	70
Montreal to Kingston	170
Kingston to Toronto	165
Via Port Sarnia:—	640
From Toronto to Guelph	47 miles.
Guelph to Sarnia	115
Sarnia to Detroit, (in Michigan)	52
Via Hamilton:—	214
From Toronto to Hamilton	40 miles.
" Hamilton to Detroit	180
	220 miles.

The Main Trunk, therefore, with its extensions, will consist of 1074 miles in Canada, of which 387 miles are under contract and in a forward state, and about 90 miles in operation.

"An Act to amend the Erie and Ontario Railroad Company," relates to a Company chartered in 1835, for the construction of a Railroad between the mouth of the Niagara River and Chippawa, thus connecting the navigation of Lakes Erie and Ontario by Railroad on the Canada side. This road will of course be in direct competition with the one already commenced on the opposite side of the river to extend from Buffalo to Youngstown.

Two Acts were passed in relation to the Bytown and Prescott Railroad, one granting certain lands in Bytown, the other amending a former charter. The Bytown and Prescott road connects the heart of the Ottawa country at Bytown, with the St. Lawrence at Prescott, immediately opposite the terminus of the Ogdensburgh road—a distance of about 54 miles. The grading of this road is in a forward state, and it is confidently asserted that it will be opened for business next season.

"An Act to incorporate the Toronto and Guelph Railway Company." This title hardly expresses the object of the Act, which empowers the Company previously chartered to extend their line to the waters of Lake Huron at Sarnia. We have already alluded to this in connexion with the Grand Trunk line; it will compete with the Great Western for the trade of the far west, and will undoubtedly obtain that portion of it which is destined to pass through Canada, on the other hand, the Great Western must always command such of the western business as will find a more profitable channel to market over the roads of New York.

The "*Toronto and Sarnia*" road, as it may more correctly be

named, passes through the best agricultural districts in Upper Canada, and will command a profitable local business.

The next Act relates to the "Peterborough and Port Hope Railroad, a charter for which was first granted in 1846. It is an important branch road, and when constructed, will bring a rich section of Canada into communication with the navigation of Lake Ontario and with the "Main Trunk." Another act charters, or rather renews a charter, granted in 1834, for the construction of a railroad from Cobourg (only seven miles from Port Hope) to Peterborough. It is not, we presume, seriously intended to construct both lines, as in that event neither could be made profitable, and either would answer every purpose in opening the interior of the country. The rivalry is confined to the towns of Cobourg and Port Hope, which are bidding for the business of Peterborough. Neither of the lines, we believe, offer any serious engineering difficulty to their construction; and the only obstruction will be of a financial character; the first to overcome that will be the successful competitor. The engineer of the Port Hope line has made his report of a preliminary survey—we are not aware that anything has been done on the other route.

"An Act authorizing the construction of a Railway from Galt to Guelph." This line will be an extension of the branch from the Great Western to Galt, already under construction. It is an effort to obtain for the Great Western Road and the City of Hamilton, a share of the business of Guelph and its vicinity, which will otherwise be drawn off by the Toronto and Guelph line. It may therefore be considered as an extension of the charter of the Great Western Company.

The Hamilton and Toronto Railway Company has obtained a Charter for constructing a Railroad between those cities. It will be an important road, as connecting the two principal cities of Canada West, and as a link connecting the Great Western with the Main Trunk at Toronto. There are no engineering difficulties likely to make this an expensive road, and it will undoubtedly afford ample remuneration for capital invested in it. A preliminary survey has been made under the direction of Mr. Benedict—late Chief Engineer to the Great Western Company. We think Toronto would have consulted her own interests had she taken a more active part in the successful prosecution of this enterprize—it will form the connecting link between this city and the roads of the State of New York, and the interests of her business in that direction, as well as westward of Hamilton, make a fair representation in its management of great importance.

"An Act to empower any Railway Company, whose Railway forms part of the Main Trunk Line of Railway throughout this Province, to unite with any other such Company, or to purchase the property and rights of any such Company; and to repeal certain Acts therein mentioned, incorporating Railway Companies."

This Act requires no comment—it is intended to facilitate the future working of the main line through the Province, under one management.

"An Act to provide for the incorporation of a Company, to construct a Railway from opposite Quebec to Trois Pistoles, and for the extension of such Railway to the Eastern Frontier of this Province."

This has already been noticed in connexion with the Main Trunk, of which it will eventually form the eastern extension towards Halifax. We understand that the necessary capital has been subscribed towards this line, and that there is a fair prospect for its early construction. It will be entitled to the Government guarantee of £3,000 sterling, per mile. From Trois Pistoles a road to Miramachi will meet the roads of Nova Scotia and New Brunswick.

"An Act to amend and extend the Act incorporating a Company for making a railroad from the Village of Industry to the Township of Rawdon in Lower Canada." This road is nearly completed—is has only a local importance.

"An Act to amend the Act incorporating the *Ontario, Simcoe and Huron Railroad Union Company*." The amendment relates to the election of Directors, and repeals that part of the original Charter which empowered the Company to raise money by lottery. This road is in a very forward state and will doubtless be the first completed road in Upper Canada. There are already 27 miles of iron laid, and it is in contemplation to open the completed portion of it immediately, beyond this twenty-seven miles, the grading is very nearly completed as far as Barrie, (63 miles from Toronto,) thence to the waters of Lake Huron, about 30 miles, the surveys are already made, and the road will be constructed before the fall of 1853. This road will receive the Government Guarantee for one-half of the cost of its construction. It is a road of great importance, as being the nearest connecting link between the navigation of Lakes Huron and Michigan, and Ontario, and will without doubt command a large share of the business of the north-west, and all the business of the vast mineral regions of Lake Superior, since the distance by this route to the projected canal at Sault Ste. Mary, and to the Straits of Mackinaw, from New York and Boston, will be less by some 250 miles than any other route. Independently of this, however, 65 miles of the road pass through a very rich and thickly settled country, the business of which has hitherto found its way to Toronto, over the "Yonge Street Macadamized Roads."

"An Act to authorize the Brantford and Buffalo Joint Stock Railroad Company, to construct a Railway from Fort Erie to Goderich." This road had been commenced from Fort Erie to Brantford, and partly graded under the General Road Act, since repealed. The present Act empowers the Company to extend their line to Goderich—it will therefore cross both the "Great Western" and the "Toronto and Sarnia," roads at nearly right angles.

"An Act to incorporate the Grand Junction Railroad Company." The Grand Junction Railway, we believe, is intended to connect Peterborough with the waters of Lake Huron at Gloucester Bay, with Toronto, and with the Main Trunk at or near Belleville. It would undoubtedly open a vast and valuable tract

of country, but we are of opinion that part of the project at least, is premature.

We have now, we believe, noticed all the Acts relating to Railways, passed during the recent session. They embrace an amount of Railway Legislation certainly unprecedented in a Canadian Parliament, and if all the roads projected are built, Canada will in no way be behind her neighbours in Railroad communication. It is true that some of the projects are of doubtful value, or at least, premature; but none of them are likely to be proceeded with, except such are well calculated to make a fair return for the capital invested. We give below a synopsis of the Railroads chartered and in progress in Canada, by which it will be seen that we now have 205 miles in operation; 618 miles under construction; and 1056 miles chartered.

NAME OF RAILROADS.	Miles Completed.	Miles under Construction.	Miles Chartered.	Total.
Montreal and Lachine Railroad	8			8
Champlain and St.Lawrence to Rouse's P't.	43			43
Rawdon and Industry		20		20
St. Lawrence and Atlantic	95	31		126
Montreal & New York, to Moer's Corners	32			32
Quebec and Richmond		90		90
Quebec and Trois Pistoles			145	145
Montreal to Kingston, } Main Trunk			170	170
Kingston to Toronto, } Main Trunk			165	165
Prescott and Bytown		54		54
Peterborough and Port Hope			27	27
Peterborough and Cobourg			30	30
Grand Junction, Peterboro' to Belleville			50	50
Do. Do. to Gloucester Bay			60	60
Do. Do. to Toronto			75	75
Ontario,Simcoe & Huron,Toronto to L.Hur.	27	66		93
Toronto and Sarnia, Toronto to Guelph		47		47
Guelph to Stratford			40	40
Stratford to Sarnia			75	75
Toronto and Hamilton			40	40
Great Western, Hamilton to London		76		76
London to Detroit		104		104
Hamilton to Niagara River		42		42
London to Sarnia			60	60
Junction to Galt		13		13
Galt to Guelph			16	16
Buffalo and Goderich, Buffalo to Brantford.		75		75
Brantford to Stratford			40	40
Stratford to Goderich			43	43
Erie and Ontario, Niagara to Chippawa			20	20
Total	205	618	1056	1881

Perreaulx Dividing Machine.

A Dividing Machine by which any scale of equal parts whatever, not exceeding a certain value, can be graduated with the greatest facility, or any arbitrary distance be divided into any arbitrary number of equal parts, is a contrivance which offers so many facilities to scientific men, engineers, draughtsmen and others, that a short account of one which attracted much notice at the Great Exhibition, may probably be interesting to our readers. The fundamental part of Perreaulx *machine à deviser &c.*, consists of a screw of exquisite workmanship, sixty centimetres in length, (23·6 inches) and of the value of half a millimetre, nearly 0·02 inch, to one revolution. The peculiar perfection of form, as regards straightness and uniformity of value, which the artist has attained in this vital part, constitutes one of the great excellencies of the apparatus. This screw gives motion to the carriage to which the graving tool, or pen is attached, and is turned by a small winch handle connected with an ingenious micrometrical apparatus, which can be set with the greatest facility, so that the act of turning the handle shall cause the graver to advance any line or distance required, from six millimetres, 0·236 inches, down to one-eight-hundredth part of a millimetre, or about the *twenty-thousandth* part of an inch. This is effected by two circles, one divided on its circumference into 200 teeth, the other having a thread or screw of twelve turns on its circumference, and also on its face, 400 equal divisions. A fixed and a moveable stop enable the operator to adjust the space scale to any value from a fraction of one revolution to twelve, a number limited only by the number of threads on the wheel or circle above referred to. The stroke of the graver is made with great delicacy by drawing out a silk cord, and there is a mechanical contrivance by which every fifth stroke is made longer than the others. The arrangement by which a wheel with 200 teeth on its circumference, which is the medium by which the motion of the micrometer circle is communicated to the screw, is made to answer the motions of a micrometer circle divided into 400 equal parts, is very ingenious: it consists simply of two rachets, one always raised when the other is down, and one-half a tooth in advance of the other,—consequently one or other will act at every four-hundredth part of a revolution. There are two microscopes to assist the measurement of given distances, but they are not required for graduating. We may illustrate the use of the machine by referring to such operations as those of the Observatory at Toronto. A great proportion of the instruments used at that establishment measure angular deviations by the principle of reflexion, that is to say, a scale of equal linear values, generally a millimetre, is adjusted opposite to a magnet carrying a plane reflector, and a fixed telescope placed at a convenient distance for observing the particular division of the scale which is reflected from the mirror, at certain moments, from which the position of the magnet is inferred. Now the angular value of each division, obviously depends upon the distance of the scale from the reflector, and this must be governed in many cases by other considerations than that of obtaining a precisely convenient value; the consequence has been, that all sorts of inconvenient fractional units appear in the records, adding greatly to the trouble of reduction, and impeding the comparison of the results with those obtained elsewhere. The same being true of almost every similar collection of observations, the result is an incredible increase to the labour of pursuing any specific enquiry through them. Every one knows what an impediment the existence of different scales of the thermometer is to extensive comparisons of climate or temperature, and it is easy to conceive what it would become if, instead of having to deal only with Fahrenheit, Celsius, and Reaumeur, each register presented us

with a different scale. Such is literally the case with the magnetical publications referred to, all of which inconvenience would probably have been saved if the machine we refer to had formed a part of the equipment of such establishments, thus allowing a scale of any special value required to be produced as often as needed—with the ordinary engines, the generation of a new scale is a serious undertaking. In fact the uses of Perreaulx machine as an addition to general philosophical apparatus, owing to the extreme minuteness and accuracy of the linear measurements of which it is capable, and the great variety of scales which can be produced are as numerous as we think they would be found in the more practical pursuits above referred to, and we should be glad to hear of some enterprizing mechanic in Canada providing one of them. The price in Paris is about £42 currency; for £20 additional the means of *circular* division are added.

Penny Wisdom.

There is a huge heap of chemical refuse now near the banks of the Tyne at Gateshead, which is not only a commercial nothing, but the manufacturer who unwillingly calls it his property, would most kindly greet any one who would take it off his hands; for he has to lease sundry acres of land for no other purpose than to deposit this refuse thereon. It is of such nothings as these that we would speak; and of the ingenuity which, from time to time, draws something therefrom. And we would also direct attention to a few miscellaneous examples of the useful application of materials long valued—the causing "a little to go a great way."

Schoolboys display great skill in breaking their slates. Shall they be allowed to continue the exercise of this interesting practice; or shall we invite them to use the new Wurtemberg slates? A manufacturer in that country has invented a mode applying a surface coating to sheet iron, which enables it to take freely the mark of a slate pencil; it is said to be much lighter, and much less liable to injury, than a common slate. If we have sheet iron slates, why not sheet-iron paper? Baron Von Kleist, the proprietor of some iron works at Nandeck, in Bohemia, has lately produced paper of this kind, from which great things seem to be expected. It is remarkable for its extreme thinness, flexibility and strength, and is entirely without flaws. It is used in making buttons, and various other articles shaped by stamping; and it is capable of receiving a very high polish. Whether the world is ever to see the *Times* printed on a sheet of iron, we must leave to some clairvoyante to determine; but, no sooner did our manufacturers become acquainted with this Bohemian product at the Great Exhibition, than they instantly set their wits to work to produce better and thinner sheet-iron than had before been made in England. In the Birmingham department, before the exhibition closed, there made its appearance about five inches by three, consising of 44 leaves of sheet-iron, the whole weighing about two ounces and a half. We are getting on: the age of iron literature may yet arrive.

Our learned chemists have lately discovered that, in making or smelting iron, not less than seven-eighths, of all the heat goes off in waste; only one-eighth being really made availabe for the extraction of the metal from its stong matrix. What a sad waste of good fuel is here: what a provoking mode of driving money out of one's pocket! So thought Mr. Budd, of the Ystalyfera ironworks in Wales. He found that the heat which escapes from an iron furnace is really as high as that of melting brass; and he pondered how he might compel this heat to render some of its useful services. He put a gentle check upon it just as it was about to escape at the top of the furnace; he gently enticed it to pass through a channel or pipe which bent downwards; and gently brought it under the boiler of the steam-engine which worked the blowing-machine for the furnace. A clever device this; for this economised caloric heated the boiler without any other fuel whatever, and there was a saving of three hundred and fifty pounds in one year in the fuel department for one boiler alone. Mr. Budd told all about this to the British Association, at Swansea, in 1848; and at Edinburgh, in 1850, he was able to tell them much more. He stated that he had applied the method to all the nine smelting-furnaces at the Ystalyfera works; and that it has also been applied at the Dundyvan Works in Scotland. The coal used in the Scotch works is of such a kind that the wasted heat from one furnace is believed to be enough to heat the air for the hot blast, and to work the blast engines for three furnaces. Mr. Budd states that his plan enabled the Dundyvan proprietors to smelt ore with a ton and a quarter less coal to a ton of iron than by the old method; and he shows how this might arise to a saving of one hundred and thirty thousand pounds a year for the whole of Scotland. A pretty-saving this—a veritable creation of something out of a commercial nothing.

Horse-shoe nails, kicked about the world by horses innumerable, are not the useless fragments we might naturally deem them. Military men may discuss the relative merits of Minie rifles, and needle guns, and regulation-muskets; but all will agree that the material of which the barrels are made should be sound aud tough, and gun-makers tell us that no iron is so well fitted for the purpose as that which is derived from horse-shoe nails, and similarly worn fragments. The nails are in the first instance made of good sound iron, and the violent concussions which they receive, when a horse is walking over a stoney road, give a peculiar annealing and toughening to the metal, highly beneficial to its subsequent use for gun barrels.

An advertisement in the *Times* notifies, that "the Committee for managing the affairs of the Bristol Gas Light Company are ready to enter into a contract for a term, from the twenty-first December next, for the sale of from sixteen thousand gallons of ammoniacal liquor, produced per month at the works of the Company." What is this ammoniacal liquor? It is a most unloveable compound, which the gas-makers must get rid of, whether it has commercial value or not. After coal has been converted into coke in the retorts of a gas-house, the vapours which escape are extraordinarily complex in their character; they comprise, not only the gas which is intended for illumination, but acids, and alkalies, and gases of many other kinds—all of which must be removed before the street gas arrives at its proper degree of purity. By washing in clean water, and washing in lime water, and other processes, this purification is gradually brought about. But then the water, which has become impregnated with ammonia, and the lime, which has become impregnated with sulphuretted hydrogen and other gases, are dolefully fœtid and repulsive; and in the early history of gas-lighting these refuse products embarrassed the gas-maker exceedingly. But now the chemists make all sorts of good things from them. The lady's smelling-bottle contains volatile salts made from this refuse ammonia, and sulphate of ammonia is another product from the same source; the tar, which is another of the ungracious consequences of gas-making, is now made to yield benezole—a remarkable volatile liquid—which manufacturers employ in making varnish, and perfumers employ in making that which is honoured by the name of oil of bitter almonds, and housewives employ in removing grease spots, and economical ladies employ in cleaning white kid gloves; the naphthaline, which annoys the gas-maker by choking up his pipes, is made to render an account of itself in the form of a beautiful red colouring matter, useful in dyeing—in short, our

gas works are a sort of magical Saving's Bank, in which commercial nothings are put in, and valuable something taken out.*

Mr. Brokeden has taught us how to make pencils out of dust. Our black lead pencils, as is pretty generally known, are made chiefly from Borrowdale plumbago, brought from a mine in Cumberland. This mine is becoming exhausted; and a question has arisen how the supply shall be kept up. Various compounds have been suggested in different quarters, but Mr. Brokeden has happily hit upon an expedient which promises wonders. Although pieces of plumbago are scarce, plumbago dust is tolerably plentiful, and Mr. Brokeden operates upon this dust. He presses a mass of the powder together, then draws out the air from beneath the particles by means of an air pump, and then presses again with such enormous force as to convert the mass into a solid block, which can be cut into the oblong prisms suitable for pencils.

If a ton of lead contains three ounces of silver—one ounce in twelve thousand ounces—will it pay to dig out this silver, mechanically or chemically? Will it save a penny? Mr. Pattinson, a manufacturing chemist at Newcastle, says, and shows that it will; although, before his improvements were introduced, the attempt was a losing one, unless the lead contained at least twenty ounces of silver to the ton. Nearly all lead ore contains a trace of silver, which becomes melted and combined in the ingot or pig of lead. Vast are the arrangements which the manufacturers are willing to make to extricate this morsel of silver from the mass in which it is buried; huge furnaces, and melting vessels, and crystallizing vessels are provided, and elaborate processes are carefully conducted. The lead, itself, is all the better for losing its silvery companion; while the silver makes its appearance afterwards in the form of dazzling tea-services, and such like.

The mention of Newcastle calls to mind our opening paragraph, relating to a certain table-land of refuse. The history of this useless product carries with it the history of many other remarkable products—once useless, but now of great value. Thus it is. Sulphur is thrown into a "burning, fiery furnace;" it burns away and is converted into a gas called sulphurous acid; this, being combined with steam and water, becomes liquid sulphuric acid. So far good; there is no refuse. But let us go on. Common salt, or rather rock salt from Cheshire, is heated with this sulphuric acid in a furnace. A peculiar penetrating gas rises, which is muriatic acid; the soda makers (of whom, more presently,) did not want this troublesome gas, and they, therefore, sent it up aloft through the chimneys. But the gardeners and farmers all around complained that the muriatic acid vapours poisoned their trees and plants, and then the manufacturers were driven to construct chimneys so lofty as to overtop our loftiest steeples in order to carry away the enemy as far above the region of vegetation as possible. But good luck or good sense came to their aid; they devised a mode of combining the gas with water, and thus was produced muriatic acid or spirits of salts; and then this muriatic acid was made to yield chlorine, and the chlorine was made to form an ingredient in bleaching powder; so that by little and little, the once dreaded muriatic acid gas has become a most respectable and respected friend to the manufacturer. Meanwhile the salt and the sulphuric acid are undergoing such changes, by heatings and mixings of different kinds, that they both disappear from the scene; the useful product left behind is soda, so valuable in glass-making, and soap-making, and other processes; the useless product is an earthly substance, consisting of calcium and sulphur, which nobody can apply to any profitable purpose, nobody will buy, and nobody even accept as a gift. At a large chemical work near Newcastle, this product has been increasing at such a rapid rate that it now forms a mass six or eight acres in extent, and thirty or forty feet high: it is a mountain or rather a table-land of difficulties. Here then, we see how chemical manufacturers are saving a penny out of some of their refuse, and looking wistfully towards the day when they may perchance save a penny out of this monstrous commercial nothing.

Coal proprietors are, perhaps necessarily, very wasteful people. They accumulate around the mouths of their pits large heaps of small coal, which, formerly, rendered service to no one; and in some parts of the country they burn this coal simply to get rid of it. But, thanks to the Legislature, it sometimes does good by interfering in manufacturing affairs. It ordained that locomotives should not send forth streams of smoke into the air, and we are thus freed from a nuisance which sadly affects our river-steamers and steamer-rivers; while, at the same time, coke being used as a non-smokable fuel, and the supply from the gas-works being too small, coke-makers have looked to the heaps of small coal at the pit's mouth; and the result is, that thousands of locomotives are now fed with coke made from the small waste coal at the collieries. The railway companies get their coke cheaper than formerly; the coal owner makes something out of a (commercial) nothing; and the ground around the coal-pits is becoming freed from an incumbrance. And what the coke makers would leave, if they leave anything, the artificial fuel makers will buy; for in most of the patent fuels now brought under public notice, coal-dust is one of the ingredients.

How to get a pennyworth of beauty out of old bones and bits of skin, is a problem which the French gelatine-makers have solved very prettily. Does the reader remember some gorgeous sheets of coloured gelatine in the French department of the Great Exhibition? We owed them to the slaughter-houses of Paris. Those establishments are so well organized and conducted, that all the refuse is carefully preserved, to be applied to any purposes for which it may be deemed fitting. Very pure gelatine is made from the waste fragments of skin, bone, tendon, ligature, and gelatinous tissue of the animals slaughtered in the Parisian abattoirs; and thin sheets of this gelatine are made to receive very rich and beautiful colours. As a gelatinous liquid, when melted, it is used in the dressing of woven stuffs, and in the clarification of wine; and, as a solid, it is cut into threads for the ornamental uses of the confectioner, or made into very thin white and transparent sheets of *papier glacè* for copying drawings, or applied in the making of artificial flowers, or used as a substitute for paper on which gold printing may be executed. In good sooth: when an ox has given us our beef, and our leather, and our tallow, his career of usefulness is by no means ended; we can get a penny out of him as long as there is a scrap of his substance above ground.

Dyers and calico-printers, like manufacturing chemists, have frequently accumulations of rubbish about their premises, which they heartily wish to get rid of at any or no price; and at intervals, by a new item added to the general stock of available knowledge, one of these accumulations becomes suddenly a commercial something. The dye material called madder will serve to illustrate this as well as anything else. Madder is the root of a plant which yields much colouring matter by steeping in water; and after being so treated, the spent madder is thrown aside as a useless refuse. The refuse is not rich enough for manure; no river conservators will allow it to be thrown into a running stream; and the dyer is thus perforce compelled to give it a homestead somewhere or other. But, some clear-headed experimenter has just found out that, actually, one-third of the colouring matter is left unused in the so-called spent madder; and he has shown how to make a pretty penny and an honest penny out of it, by the aid of certain hot acids.

* See also an article headed Gas Perfumery, in volume 3, page 334 of this Miscellany.

Whether any perfumed lady would be disconcerted at learning the sources of her perfumes, each lady must decide for herself; but it seems that Mr. De la Rue and Doctor Hoffman, in their capacities as jurors of the Great Exhibition, have made terrible havoc among the perfumery. They have found that many of the scents said to be procured from flowers and fruits, are really produced from anything but flowery sources; the perfumers are chemists enough to know that similar odours may be often produced from dissimilar substances, and if the half-crown bottle of perfume really has the required odour, the perfumer does not expect to be asked what kind of odour was emitted by the substance whence the perfume was obtained. Now, Doctor Lyon Playfair, in his summary of the jury investigation above alluded to, broadly tells us that these primary odours are often most unbearable. "A peculiarly fœtid oil, termed fusel oil, is formed in making brandy and whiskey; this fusel oil, distilled with sulphuric acid and acetate of potash, gives the oil of pears. The oil of apples is made from the same fusel oil, by distillation with sulphuric acid and bichromate of potash. The oil of pine-apples is obtained from a product of the action of putrid cheese on sugar, or by making a soap with butter, and distilling it with alcohol and sulphuric acid; and is now largely employed in England in making pine-apple ale. Oil of grapes and oil of cognac, used to impart the flavour of French cognac to British brandy, are little less than fusel oil. The artificial oil of bitter almonds, now so largely employed in perfuming soap and for flavouring confectionary, is prepared by the action of nitric acid on the fœtid oils of gas-tar. Many a fair forehead is damped with *eau de millefleurs*, without knowing that its essential ingredient is derived from the drainage of cowhouses. In all such cases as these, the chemical science involved is, really, of a high order, and the perfume produced is a bona-fide perfume, not one whit less sterling than if produced from fruits and flowers. The only question is one of commercial honesty, in giving a name no longer applicable, and charging too highly for a cheaply produced scent. This mode of saving a penny is chemically right, but commercially wrong.

The French make a large quantity of sugar from beet-root; and in the processes of manufacture there remains behind a thick, black, unctuous molasses, containing much sugar, but from other causes impregnated with a nauseous taste and a most disagreeable smell. Men will not eat it, but pigs will; and so to the pigs it has gone, until E. Dubranfaut showed (as he has lately done,) that this molasses is something better than pig's meat. He dissolves, and decomposes, and washes, and clarifies, until he ends by producing a kind of *eau sucré*, a beautiful clear and colourless syrup or sugar-liquid, containing nearly the whole of the saccharine principle from the offensive and almost valueless molasses.

How can we make one kind of paint or liquid produce many different colours, and this with an amount of material almost beneath the power of man to weigh or measure? Mr. De la Rue has solved this question by the production of his beautiful iridescent and opalescent paper. Both mechanically and optically, the production of these papers is strikingly interesting. Water is poured into a flat vessel; and, when quite tranquil, a very minute quantity of spirit varnish is sprinkled upon the surface: this, by a species of attraction between the two liquids, spreads out on all sides, and covers the whole surface in a film of exquisite thinness. A sheet of paper or a card-board, or any other article, is then dipped fairly into the water, and raised gently with that surface uppermost which is to receive the coloured adornment; it lifts up the film of varnish from off the surface of the water, and this film becomes deposited on the paper itself. The paper is held in an inclined position, to allow the water to drain off from beneath the film; and the varnish then remains permanent on the surface of the paper. Now, the paper thus coated with colourless varnish exhibits the prismatic tints with exquisite clearness; the film of varnish is so extremely thin—so far beneath anything that could be laid on with a brush or pencil—that it reflects light on the same principle as the soap-bubble, exhibiting differences of colour on account of minute differences in the thickness of the film at different parts; and not only so, but the self-same spot exhibits different tints according to the angle at which we view it. It is a lovely material, and lovely things may be produced from it. We cannot speak of it as producing something out of nothing; but it is a means of producing a beautiful result with a marvellously small expenditure of materials.

The clinkers, ashes, or cinders, which remain in furnaces after metallurgic operations have been completed, may appear to be among the most useless of all useless things. Not so, however. If they contain any metal, there are men who will ferret it out by some means or other. Not many years since, the ashes of the coke used in brass-furnaces were carted away as rubbish; but shrewd people have detected a good deal of volatilised copper mixed up therewith; and the brass-makers can now find a market for their ashes as an inferior kind of copper ore. It needs hardly to be stated that all sorts of filings and raspings, cuttings and clippings, borings and turnings, and odds and ends in the real metallic form, are all available for re-melting, whatever the metal may be—all is grist that comes to this mill. If the metal be a cheap one, it will not pay to extricate a stray per centage from ashes and clinkers; but, if it be one of the more costly metals, not only are all scraps and ashes and skimmings preserved, but particles are sought for in a way that may well astonish those to whom the subject is new. Take gold as an example. There are Jew dealers and Christian dealers also, who sedulously wait upon gilders and jewellers at intervals, to buy up everything (be it what it may) which has gold in or upon it. Old and useless gilt frames are bought; they are burnt, and the ashes so treated as to yield up all their gold. The fragments, and dust of gold, which arise during gilding, are bought and refined. The leather cushion which the gilder uses is bought when too old for use, for the sake of the gold particles which insinuate themselves into odd nooks and corners. The old leather apron of a jeweller is bought; it is a rich prize, for in spite of its dirty look, it possesses very auriferous attractions. The sweepings of the floor of a jeweller's workshop are bought; and there is probably no broom, the use of which is stipulated for with more strictness than that with which such a floor is swept. In short, there are in this world (and at no time so much as at the present) a set of very useful people, who may be designated manufacturing scavengers: they clear away refuse which would else encumber the ground and they put money into the pockets both of buyers and sellers; they do effectually create a something out of a commercial nothing.

How to save a penny by using dairy drainage, and slaughter-house drainage, and house drainage, and street drainage, and stable drainage, and old bones, and old rags, and spent tan, and flax steep-water—how to create value by using such refuse as manure for fields and gardens—is one of the great questions of the day, which no one who takes up a newspaper can fail to find elucidated in some form or other. Chemistry is here the grand economiser. Chemistry is indeed Nature's housewife, making the best of everything. "The clippings of the travelling tinker," as Dr. Playfair well says in one of his lectures, "are mixed with the parings of horses' hoofs from the smithy, or the cast-off woollen garments of the inhabitants of a sister isle, and soon afterwards, in the form of dyes of brightest blue, grace the dress of courtly dames. The main ingredient of the ink with which I now write was possibly once part of the broken hoop of an old beer barrel. The bones of dead animals yield the chief constituent of lucifer matches. The dregs of port wine—carefully rejected by the port wine drinker in decanting his favourite

beverage—are taken by him in the morning, in the form of Seidlitz powders, to remove the effects of his debauch. The offal of the streets and the washings of coal-gas re-appear carefully preserved in the lady's smelling bottle, or are used by her to flavour *blanc mange* for her friends."—*Dickens' Household Words.*

We have much pleasure in inserting the following communication from Mr. Vincent Parkes, of Toronto, whose earnest desire to disseminate practical and useful information among working mechanics, has already been acknowledged by the Canadian Institute and the Toronto Mechanics' Institute. Mr. Parkes has himself constructed a beautiful little working model of a locomotive, in which the steam is generated by means of a small spirit lamp. Many of our readers will remember the interest which this little locomotive attracted at the annual exhibition of the Mechanics' Institute a year or two ago. Since that period Mr. Parkes has invented and constructed a new variety of steam-engine, a description of which forms the subject of his communication. We are happy to state that both the locomotive and the working model of his new engine, (for which he received a gold medal from the Governor General at the Canadian Industrial Exposition in 1850,) are now the property of the Canadian Institute, having been presented to that body by Mr. Parkes:—

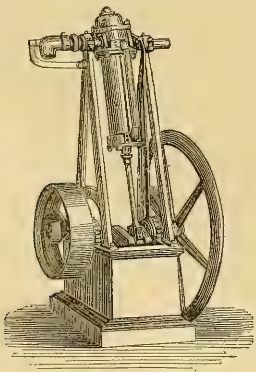


FIG 1.—Perspective view.

PENDULUM STEAM ENGINE; BY MR. VINCENT PARKES.

The object in view was to simplify the ordinary Oscillating Steam Engine. The arrangement consists in a semi-rotary slide valve moving within the steam-chest, and placing the steam-chest (with its peculiar steam ports) upon the end of the steam cylinder, the steam and exhaust branch pipes of the steam-chest to form trunions upon which the steam-chest and cylinder can freely vibrate so as to conform with the position of the crank, as is illustrated by the following diagrams:—

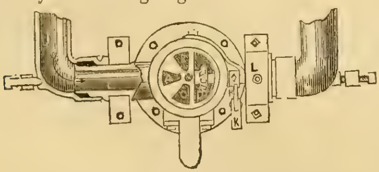


FIG 2.—Plan showing the Face of Steam-Chest, Steam-Ports, Steam and Exhaust Pipes.

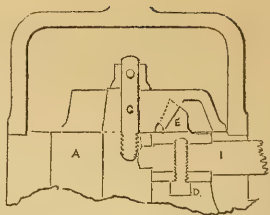


FIG 3.—Section of Steam-Chest, showing Steam and Exhaust Pipes.

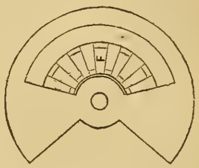


FIG 4.—Slide Valve, showing segment of Mitre Wheel cast in the cavity of the Face.

In all the diagrams, A represents the steam port, communicating from the branch pipe J to the steam-chest.

B—Steam port passing direct through, communicating from the steam-chest to the upper end of the cylinder.

C—Steam port connects with side pipe, communicating from the steam-chest to the lower end of the cylinder.

D—Exhaust port communicating with exhaust pipe.

E—Segment of mitre-wheel working into the corresponding wheel F in face of slide valve.

G—Centre pin upon which the slide valve moves secured firm into the face, with a washer secured upon the upper end to prevent the valve from rising off the face by the action of the mitre wheels.

H—Lever secured on the spindle I and connected to the eccentric rod.

I—Spindle of mitre wheel.

J—Branch pipe from boiler.

K—Upper end of eccentric rod.

L L—Trunions showing the external appearance on the exhaust side and section on the steam side.

By this arrangement the steam ways are much simplified, the trunions, cylinder, cover and steam ways are in one casting that may be finished entirely in the lathe. By the trunions being placed at the upper end of the cylinder it becomes a pendulum, and does not require the same effort of the crank to arrest the motion of the cylinder, also the angle of vibration is much less than the ordinary arrangement where the trunions are placed in the centre of the cylinder. This kind of engine, with suitable reverse gear, is particularly applicable to propellers.

The Ancient Miners of Lake Superior; by Charles Whittlesey.*

I shall not enter into a *description* of the extensive mining operations that have been carried on in very remote periods, on the shores of Lake Superior. They are of great magnitude and are found extending over a wide space. As far as at present known, the most striking remains of the ancient miners, are on

*This article, showing the connexion of the *Aztecs* or *Ancient Mexicans*, with the ancient mining operations on Lake Superior, was prepared for delivery before the American Association, at the expected meeting at Cleveland, in August last.—(*Annals of Science, Cleveland.*)

the Ontonogon River, extending 15 or 20 miles along the trap range each way from where it crosses the course of that stream.

They are also very apparent in the vicinity of Portage Lake. On Point Kewena they may be seen extending from the Forsyth location, (now Fulton,) eastward along the range about 20 miles, and across the Lake on Isle Royal, are abundant evidences of mining operations of the same era. The details, concerning the mode in which these mines were worked—the depth and extent of their excavations; the tools, implements, &c., used—may be seen in the Reports of the Government Geologists, and in Mr. Foster's paper on that subject in the Smithsonian Contributions.

I shall confine myself to the evidences which show the connexion, or rather the identity of the people who wrought these mines, with the "race of the mounds," which anciently occupied the State of Ohio, and from them to the Aztecs, the ancestors of the Mexicans.

That part of the discussion which connects the "race of the mounds" or the "mound builders" with the Aztecs, will be brief. The foundation for this relationship, is the learned work of *Mr. Delafield*, upon the Antiquities of America, where all the points bearing upon the question are most ably presented. If Mr. Delafield does not establish the point that the Mexicans are descendants of the "mound builders," he succeeds in giving his opinion as nearly the character of a demonstration, as the nature of the subject allows. Many of his proofs must, of necessity, rest upon tradition, which is always vague, upon symbolical paintings, sculptures, and characters, such as all the ancient, ignorant, and half civilized nations made use of, and which constitute *their history*, and their only history. We cannot expect, in such enquiries, the strict conviction, which is required under oral testimony in a court of law; if we did, there is little of written history that would command our belief. In affairs of such remote antiquity we must of necessity, deal in speculations and deductions, or we must abandon the subject altogether.

Nothing is better settled in ethnology, than that the North American Indian, or Northern Aborigines, belong to the *Mongolian* or Tartar family, which inhabits Northern Asia.

On the basis of craniology, according to which the human race is divided into families, by naturalists, the race of the mounds is unequivocally distinct from the North American Indian. Mr. Delafield's enquiry into the origin of the "race of the mounds," and the excellent work of Squier and Davis, upon the Ancient Monuments of the Mississippi Valley, show conclusively, that the ancient mounds of the Mississippi valley are the same as those of Mexico and Peru.

They have been examined from the western part of New York, southerly and westerly, through the States, on the Mississippi, to Texas, and thence through Mexico and Central America to Peru, and are found to have a common external appearance. The same elevated platforms of earth are seen in Ohio and in Mexico, on which, it is presumed, the same religious rites were once celebrated.

In Peru, the Spaniards, when they conquered that country, found lines and circles of embankment, with exterior ditches, situated on the summit of difficult hills, having the form and structure of the so-called "Indian forts," that are so numerous in this State.

At the South, these works are built on a larger scale than they are here, but after the same general pattern.

The mounds at Grave Creek, Virginia; at Miamisburgh, Ohio; at St. Louis, Mo.; and at Moorehouse Paris, Louisiana, are exceeded in bulk by the Pyramid of Cholula, in Mexico; but all belong to the same system. The *similarity* of the earth-works, over so large a space, is one of the links in the chain of evidence adduced by Mr. Delafield.

Another point is supported by historical proof. There are among the Mexicans, national annals, which say, that about the year 600 of our era, their ancesters migrated from the north, under an Emperor named *Citin*, or *Votan*. There have been comparisons made between *three* sculls, taken from ancient mounds in the valley of the Mississippi, and that belong to the race of the mounds, if any of the relics which are found here do; and *three* others, which were procured from ancient tumuli in Peru. —*Ancient Monuments, see p.* 291-2. Their anatomical proportions correspond so well, that craniologists pronounce them to be of the same family.

The pyramid of Cholula, which our officers visited during the war, is built of unburnt brick and of clay. The ruins of *Aztelan* on the Rock River, Wisconsin, show that brick were used in the construction of the walls; but which were partially burnt.

The Mexicans believed in, and worshipped, an evil spirit, which they called *Tlacalecalatl* or the "rational owl," and had made images of this bad deity in the form of an owl. The "mound builders," also made and deposited in their tumuli, images of the owl, which doubtless had some connexion with their superstitions, probably the same as the Mexican owls.

These are the principal proofs that the race of the mounds were the ancestors of the Aztecs, and of the Toltecs, a branch of the same family, who inhabited the country about Copan. There is, moreover, a tradition, and also hieroglyphical maps among the Mexicans, and credited by them, showing that their progenitors, like the Mongolian ancestors of our Indians, were *emigrants from Asia*, by the way of Behring's Straits.

I adopt the conclusions of Mr. Delafield, as to the mound builders, because it is not merely an hypothesis; but is based on strong analogies, and upon many facts.

To suppose that the "race of the mounds" has become extinct, would be far more unreasonable, because it is contrary to the history of nations, and is sustained by no evidence.

Here I leave the subject of *identity* between the ancient Mexicans and the ancient race of the mounds; and turn to the consideration of the question, whether they are the people who wrought the copper veins of Lake Superior in ancient times.

Mr. Delafield observes, that there are traditions among the Indians, that their ancesters drove out a people who inhabited North America, and who occupied the ancient earth-works of the west. I have never been able to verify the existence of such a tradition; but in numerous cases, where Indians have been questioned upon the subject of the mounds, they have replied that they knew nothing about them, or the people who built them. The most probably theory, on this point, is, that the country was abandoned voluntarily by the Aztecs. These military works show no signs of having been attacked, or of having undergone protracted sieges. If they had been attacked, there certainly would have been resistance; for a people so numerous, and so well fortified, would not have fled like cowards before an enemy, however numerous, in the open field. An enemy could not have invested these fortifications without constructing *similar works* of attack. A permanent fortification, of any kind, cannot be carried by storm; but only after a tedious approach, sustained by works of a like kind, such as trenches of circumvallation and contravallation.

Of works of attack there are no remains, so far as I am informed, and but one instance where earth-walls appear to have been demolished in their day; this occurs, in a short line of embankment, separating the great fortification, on the Little Miami, into two parts. The double walls across the narrow part of the works, inside, appear to have been thrown down, violently, as though a party in the north portion of the fort had succeeded in breaking into the southern portion,

There is no proof that our Indians erected works of defence until after the French and Spaniards had taught them to do so, by building stockades in their midst. Before this time, they had no need of such defences, under their mode of warfare, against each other. Of what value would picketed forts be to wandering tribes, who make war with knives and arrows; by long journeys and sudden surprises; who never accumulate provisions or attack in the open field? Much less, would they build permanent works with walls and trenches.

There are cases where our North American Indians, after the appearance of the whites, and the introduction of *fire-arms*, as a matter of necessity, have fortified themselves against other tribes, and the whites, who had musquetry as weapons of attack; but even this rude picketing which they have been forced to set up is of very rare occurrence. They make war now, in general, as they did 250 years ago, by surprise; striking a secret and terrible blow, securing the scalps of the enemy and making a sudden retreat. They have, and always have had, too little industry and forethought to make permanent defences, preferring, like the wild animals they resemble, to make strongholds of jungles and swamps—provided by the great spirit—in preference to the artificial works of their own hands. A people that does not cultivate the soil, will not be likely to construct works to protect them in the possession of it.

Neither is there any satisfactory evidence, that another people intervened between the mound builders and the Aborigines, occupying the country after the mounds were built, and before the Indians took possession of it.

If the Mexican history is true, according to which the Aztecs arrived in Central America about the year A. D. 600; or 1200 years ago, there has not been *time enough*, since their departure from the banks of the Ohio, and Mississippi, for another people to arise to occupy the same ground and to disappear. If their was such a people, the present Indians would be more likely to know something of them than their predecessors.

In the year 1001, the *Icelanders* sailing westward to Greenland, and coasting thence southward, visited the shores of New England. They found upon the Atlantic coast a savage people, who, from the description given, were the same as our Aborigines. Only five hundred years after, when Sebastian Cabot, and Americus Vespucius navigated the same seas, the same tribes inhabited the New England coasts.

About the same time Pamphileo De Narvarre and Hernando De Soto, (1528 and 1540,) traversed the interior of Florida, Mississippi, Tennessee, Arkansas, and Texas, and found there tribes that remain to this day.

The bones, and particularly the skulls, that Mr. Brainerd and myself exhumed last year in a sandstone cavern, in Elyria, Lorain Co., Ohio, noticed in the proceedings of the American Association, at the Cincinnati meeting, are in all probability those of Aborigines, and are from 1000 to 2000 years old.

All these facts go to show, that the present Indian family has occupied the country, from which the mound builders emigrated, more than 1000 years, and that they were their immediate successors.

It is not probable that they withdrew suddenly, leaving a beautiful and well cultivated country, which they owned and had strongly fortified, in one night as the Israelites did Egypt. They gradually changed their position for a still more fertile and genial region, upon the Gulf of Mexico, and the Pacific Ocean. In time the Northern Indians, who lived upon wild game and fish, and not upon the products of the soil, finding the country south of the great Lakes unoccupied, and growing up to be again a forest, where game could exist, extended themselves over it.

But, admitting that the Aborigines were the next occupants after the mound builders, is there any substantial grounds for attributing to the Indians, the ancient workings of the copper mines of Lake Superior?

If they did possess the skill to plan, and the industry to execute the immense rock excavations which are observed there, it is evident to all who know them in the present state. that they have *lost* both their skill and their industry.

Is it rational to suppose, that the same people living upon the same spot, under the same influences, would have thus changed?

The working of such extensive mines would require, not only the persevering labour of many hundred men, but the labour of as many more employed somewhere in the cultivation of the soil, or in some other mode, collecting provisions for those who wrought in the mines. Is the North American Indian capable of devising or carrying out any such prolonged and systematic plan of operations?

By what influence did he rise to that condition, so much above his present one, that would not have operated to keep him there?

In his history, from the landing of the Spaniards in 1528, to this day, he has exhibited as a great family of the human race, a most dogged indisposition to improvement, and even to change of pursuits.

He is fond of giving traditions, both fictitious and real, extending back in the history of his people many hundred years. Would he have lost, or pretended to lose, the memory of such a fact as the working of these mines?

There is an old Indian, of the Chippewa nation, who lives at the mouth of the St. Louis River, at Fond-du-Lac, of Lake Superior, by the name of "Loons Foot," who traces back his ancestors by name, about 400 years, during which time they have been like him, hereditary chiefs in his tribe.

In September, 1849, I caused him to be questioned, by a gentleman from Canada, who is his nephew, in relation to the copper mines that have been worked of old, on Lake Superior. He made a long story, as Indians generally do, with many gesticulations and embellishments, which was in substance as follows:

"A long time ago the Indians were much better off than they are now. They had copper axes, arrow heads, and spears; and also, stone axes. Until the French came here, (1641,) and blasted the rocks with powder; we have no traditions of the copper mines being worked, and don't know who did work them. Our forefathers used to build big canoes and cross the Lake over to Isle Royal, where they found more copper than anywhere else. The stone hammers that are now found in the old diggings we know nothing about. The Indians were formerly much more

numerous, and happier, than they are now. They then had no wars, and such troubles as they have now."

The earliest French Missionaries found among the Indians, a very few, but very rude and illy formed copper knives. But there is no difficulty in distinguishing the implements of copper which they had from those that are found in the ancient mounds of Ohio. They are much more rude, and less perfect, in their construction. One of these knives may be seen figured by Mr. Squier, on page 201, of the Smithsonian Contributions, vol. 1.

The Indians knew of the existence of boulders or detached masses of copper, and when they found small pieces of it in the gravel, or on the pebble beach, they made use of the best skill of which they were possessed to fashion it into some useful implement.

Mr. S. W. Hill, of Eagle Harbor, Lake Superior, informed me, that in digging the foundation for a house at that place, at about four (4) feet below the surface, in the water washed sand of the Lake, there was found evidences of an attempt to melt by fire, some pieces of copper from a neighboring vein. This was, doubtless, the work of our Indians.

Mr. Bailey, of the same place, described to me an instrument of copper which he found in the gravel within Fort Williams, that appeared to have been used either for skinning animals or for dressing and working the skins. It resembled, somewhat, the circular knife of a saddler, without its wooden handle.

I have found in the soil or loose materials, pieces of native copper, that with a little beating in a cold state, might be fashioned into a rude knife or cutting instrument; and it is from such masses that I conclude all the implements known to the Indians were made. Those taken from the mounds of Ohio are much more finished and entirely different in form.

According to the relations of the Jesuit Missionaries, the Indians often preserved pieces of pure copper, which they picked up on the beech, as "manitous," or Gods, which they would not have done had this metal been so common as the working of the mines would make it.

The conjecture that the Indians knew of and worked the mines, but concealed them from the French, is not very plausible.

The entire length of the excavations now known, must be 25 or 30 miles, some of them on the coasts and navigable waters, and not easily concealed. Although the Indians are reluctant to disclose minerals to white men, they have done so in many cases of copper masses, but never of veins or ancient mines. They would be as likely to do one as the other, if they knew of them. But all of the ancient works yet explored, show that they have been *abandoned* more than 500 years, and not only before the French first heard the Indians speak of copper, but before Columbus landed on the Continent.

(To be continued.)

The Natural History of the British Seas; By Prof. E. Forbes.

The Natural History of the British Seas has for a long time been a favorite subject of investigation. Within the last fifteen years, however, fresh inquiries have been set on foot, and the details of their zoology and botany worked out to an extent beyond that to which the examination of any other marine province has been carried. Numerous and beautiful illustrated monographs, treating of their fishes, Cetacea, portions of the Articulata, the Mollusca, Radiata, Zoophytes, Sponges, and Algæ, have been published, either at private cost, or by the patriotic publishers, or by the Ray Society, such as the scientific literature of no other country can show. As these have all been the results of fresh and original research, they present a mass of valuable data sufficient to form a secure basis for important generalizations.

From these materials, and from the results of the inquiries into the distribution of creatures in the depth of our seas, conducted by a committee of the British Association, a clear notion may be formed of the elements of which our submarine population is composed. Extensive tables, exhibiting the sub-littoral distribution of marine invertebrata, from the South of England along the Western coasts of Great Britain to Zetland, mainly constructed from the joint observations of Professor E. Forbes and Mr. MacAndrew, are now preparing for publication, as a first part of a general report from the committee referred to. The data embodied in these tables are the produce of researches conducted during the last eleven years, and registered systematically at the time of observation.

British marine animals and plants are distributed in depth (or bathymetrically) in a series of zones or regions which belt our shores from high water mark down to the greatest depth explored. The uppermost of these is the tract between tidemarks; this is the Littoral Zone. Whatever be the extent of rise and fall of the tide, this zone, wherever the ground is hard or rocky, thus affording security for the growth of marine plants and animals, presents similar features, and can be subdivided into a series of corresponding sub-regions; through all of which the common limpet (*Patella vulgata*) ranges, giving a character to the entire belt. Each of these sub-regions has its own characteristic animals and plants. Thus the highest is constantly characterized by the presence of the periwinkle *Littorina rudis*, (and on our western shores, *Littorina neritoides*,) along with the sea-weed *Fucus canaliculatus*. The second sub-region is marked by the sea-weed *Lichina* and the common mussel (*Mytilus edulis*.) In common with the third sub-region it almost always presents rocks thickly encrusted with barnacles; so that where our shores are steep, a broad white band, entirely composed of these shell-fish, may be seen when the tide is out, marking the middle space so conspicuously as to be visible from a great distance. In the third sub-region the commonest form of wrack or kelp (*Fucus articulatus*) prevails, and the largest periwinkle (*Littorina littorea*) with the *Purpura capillus* are dominant and abundant. In the fourth and lowest sub-region the *Fucus* just mentioned gives way for another species, the *Fucus serratus*; and in like manner the shells are replaced by a fresh *Littorina (littoralis)* and peculiar *Trochi*.

Once below low-water mark the periwinkles become rare, or disappear, and the *Fuci* are replaced by the gigantic sea-weeds known popularly as tangles (species of *Laminaria*, *Alaria*, &c.,) among which live myriads of peculiar forms of animals and lesser plants. The genus *Lacuna* among shell-fish is especially characteristic of this zone. In sandy places, the *Zostera* or grass-wrack replaces the *Laminaria* The Laminarian Zone extends to a depth of about fifteen fathoms, but in its lowest part the greater sea-weeds are comparatively few, and usually the prevailing plant is the curious coral-like vegetable called Nullipore.

From 15 to 50 or more fathoms we find a zone prolific in peculiar forms of animal life, but from which conspicuous vegetables seem almost entirely banished. The majority of its inhabitants are predacious. Many of our larger fishes belong to this region, to which, on account of the plant-like zoophytes abounding in it, the name of Coralline Zone has been applied. The majority of the rarer shell-fish of our seas have been procured from this region.

Below 50 fathoms is the region of deep-sea corals, so styled because hard and strong true corals of considerable dimensions

are found in its depths. In the British seas it is to be looked for around the Zetlands and Hebrides, where many of our most curious animals, forms of zoophytes and echinoderms, have been drawn up from the abysses of the ocean. Its deepest recesses have not as yet been examined. Into this region we find that not a few species extend their range from the higher zones. When they do so they often change their aspect, especially so far as color is concerned, losing brightness of hue and becoming dull-color or even colorless. In the lower zones it is the association of species rather than the presence of peculiar forms which gives them a distinctive character. All recent researches, when scientifically conducted, have confirmed this classification of provinces of depth. When we have an apparent exception, as in the case of the submarine ravine off the Mull of Galloway, dredged by Capt. Beechy and recorded by Mr. Thompson, in which, though it is 150 fathoms deep, the fauna is that of the coralline zone, we must seek for an explanation of the anomaly by inquiring into the geological history of the area in question. In this particular instance there is every reason to believe that the ravine mentioned is of very late date compared with the epoch of diffusion of the British fauna.

When we trace the horizontal distribution of creatures in the British seas, we find that though our area must be mainly or almost entirely referred to one of the great European marine provinces, that to which the lecturer has given the name of Celtic, yet there are sub-divisions within itself marked out by the presence or absence of peculiar species. The marine fauna and flora of the Channel Isles present certain differences, not numerous but not the less important, from that of the south-western shores of England, which in its turn differs from that of the Irish sea, and it again from that of the Hebrides. The Cornish and Devon sea fauna and that of the Hebrides are marked by redundancies of species; that of the eastern coast of England on the contrary by deficiencies. Along the whole of our western coasts, whether of Great Britain or Ireland, we find certain creatures prevailing, not present on our eastern shores. In the depths off the south coast of Ireland we find an assemblage of creatures which do not strictly belong to that province, but are identical with similar isolated assemblages on the west coast of Scotland. In the west of Ireland we find a district of shore distinguished from all other parts of our coasts by the presence of a peculiar sea-urchin, to find the continuance of whose range we must cross the Atlantic to Spain. In such phenomena the lecturer sees evidences of conformation of land, of outlines of coast and connections of land with land under different climatal conditions than at present prevail within our area, for an explanation of which we must go back into the history of the geological past. If we do so, we can discover reasons for these anomalies, but not otherwise.

The dredging researches about to be published, go to show that among our sublittoral animals the northern element prevails over the southern,—a fact indicated by the number of peculiar northern species; at the same time the southern forms appear to be diffusing themselves northwards more rapidly than the northern do southwards. This diffusion is mainly maintained along our western shores, and appears to be in action, not only in the British seas, but also along the shores of Norway. We must attribute it to the influence of warm currents flowing northwards, originating probably in extensions of the gulf-stream. The body of colder water in the depths of our seas preserves the original inhabitants of this area, remnants of the fauna of the glacial epoch, overlain and surrounded by a fauna of later migration, and adapted to a higher temperature. A curious fact respecting the marine creatures of the Arctic seas of Europe, viz., that the littoral and laminarian forms are peculiarly arctic, whilst the deeper species are boreal or celtic, may be explained also by the influences of warm currents flowing northwards and diffusing the germs of species of more southern regions in the coralline and deep-sea-coral zones; for in the arctic seas the temperature of the water is higher at some depth than near the surface. On the other hand, we find in a region farther to the south than Britain an outlier of the celtic fauna preserved in the bays of Asturias, where it was discovered in 1849 by Mr. MacAndrew; a very remarkable fact, and one appealed to by the lecturer as confirmatory of his theory of an ancient coast extension between Ireland and Spain.

There is still much to be done in the investigation of the natural history of our seas, and many districts remain for more minute exploration. It is chiefly among articulate animals and especially among worms, that fresh discoveries may be looked for. Yet even now, new and remarkable forms of mollusca may occasionally be procured, and, during the autumn of last year, in a cruise with Mr. Mac Andrew, no fewer than twenty additional molluscs and radiata were discovered in the Hebrides, and have just been described by the lecturer in conjunction with Professor Goodsir. Among these is one of the largest, (if not the largest) compound ascidians ever discovered. In our southernmost province, fresh and valuable researches have been conducted during the past year by Professor Acland and Dr. Carus, who, selecting the Scilly Isles as a field for exploration, have filled up a blank in our fauna.

The lecturer concluded by an expression of gratification at the spread and progress of natural history studies in Great Britain among all ranks, and at the love of science manifested in the systematic manner in which our fauna and flora have been explored, and the beautiful works which have been produced in illustration of them.

Government School of Mines.

The session of 1852-3 was opened on Wednesday, November 3rd, with an introductory lecture by Dr. Lyon Playfair, on the very appropriate subject of the industrial education on the Continent. A review was taken of the vast importance of skill and labour in the arts, by which this country was enabled to import cotton from India and America, to export it again as calico and manufactured articles; malachite and other cupriferous ores from Russia and Australia, to be sent to all parts of the world as refined copper, with many other natural products which received an equal increase in value from the hands of the artizan, rendering it of the utmost importance to cultivate the intellect, and improve industrial experience with the light of scientific truth. It was then shown that intellectual information on the Continent, as relates to the arts, existed to a greater extent than in this country, partly owing to the care bestowed on real scientific education there, and partly to the British artizan relying too much on practice, and too often sneering at the application of scientific theories, so essential for carrying out that practice to a successful issue. It was also shown that this education had led to the establishment and rapid growth of new industries abroad, by which foreign states were realizing an increasing amount of production, leaving us a decreasing standard. In describing the various continental schools, Dr. Playfair commenced with Prussia, where there are three descriptions of institutions, the Gymnasia, the Real Schools, and the Trade Schools; pupils admitted at 14 years old for two years, must have had a practical elementary education, when they receive a full course of instruction, qualifying them for miners, engineers, architects, mathematicians, or for any branch of the arts for which they may be intended. The education is not gratuitous, but does not cost each student more than from 30s. to 60s. per annum, while the cost to the State for about 1200 students is £7000 a year. Saxony also has the same three kinds of schools. Austria has no Trade Schools, but several polytechnic establish-

ments, the one in Vienna being the largest in Europe, costing £11,000 per annum; there are also Holiday and Sunday Schools, in which the workmen take great interest, and their knowledge and research into the various sciences is a matter of astonishment to Englishmen. In Bavaria there are no Real Schools, but 26 Trade Schools, one for every large town; they are supported by the localities, the Government exercising supervision, and sending commissioners periodically to inspect. There are also Holiday Schools, and the entire number of students may be about 3000. The Baden Gymnasia, and High Standard Schools of burghers and trade were represented as the most perfect in Europe, there was an average of 41 teachers to 430 pupils; the expense to the Duchy is about £4100 per annum, and the cost to the student £6 annually. The lecturer estimated that there were 13,000 students receiving an industrial and systematic education in all Germany, and from 30,000 to 40,000 working men improving their mind by Holiday and Sunday Schools. France was next reverted to: besides the great and well-known schools of the Government, such as the *Ecole Polytechnique*, the *Ecole des Mines*, the *Ecole des Ponts et Chaussées*, and the *Conservatoire des Arts et Métres*, there is a private institution, the *Ecole Centrale des Arts et Manufactures*, established by private capital, which has obtained the most ample remuneration by its success. So important is this to the industry of France that the Government and the *Conseils Géneraux* of 29 departments have established exhibitions in connection with it. The school has 300 students, taught by 40 professors of the highest eminence. So much valued are the certificated students of this school by the manufacturers of France, that they are sure of immediate and important employment. Belgium and Denmark were also noticed as having public schools; and the lecturer emphatically implied that the time had now arrived when England must no longer be supine in the matter, but take a bold step on the subject of industrial education, inculcating the principle that practical experience must go hand in hand with philosophical science to bring the arts of any country to a high standard of excellence. The course of lectures for the session of five months are—

1. Chemistry applied to Arts and Agriculture—Lyon Playfair, F.R.S.
2. Natural History applied to Geology and the Arts—Edward Forbes, F.R.S.
3. Mechanical Science, with its Applications to Mining—Robert Hunt, Keeper of Mining Records.
4. Metallurgy, with its Special Applications—Jno. Percy, M.D.. F.R.S.
5. Geology, and its Practical Applications—A. C. Ramsay, F.R.S.
6. Mining and Mineralogy—Warington W. Smith, M.A., F.G.S.

Agricultural Extracts.

The Origin of some Agricultural Inventions.—A Devonshire farmer invents a modification of the rotatory churn, in which, by making it revolve in an outer casing of warm water, tempered by the aid of the thermometer, he can at all seasons of the year command the best degree of warmth for separating the butter, and thus finish the process in a time at once brief and uniform. The French minister sees this at the Society of Arts and encloses a description of it to Paris. A model is made, somewhat altered, and exhibited at the "Exposition." A Scotch director of the Highland Society has a copy made of it, carries it over to Edinburgh, where the scientific principles of its construction are highly lauded, and for the next six months all the Ayrshire amateurs are treating their friends to butter made in ten minutes, and amusing them with the wonders of the French churn. A Yorkshire smith, living in the midst of heavy land, fixes harrow teeth into a long cylindrical axle at uniform distances, and fitting two of these axles together, so that the teeth of one shall play between those of the other, when it is dragged along the land, forms a machine admirably adapted for the tearing of heavy brittle clods asunder. It is known to few, and attracts little notice at home; but it gets to Norway. Seen there by an Englishman, it is pronounced, as it is, a thing of first-rate excellence, and, under the name of the "Norwegian harrow," it obtains a distinguished place in our future agricultural shows. A Scotch Presbyterian minister puts together, in 1825, an adjustment of wheels and scissors-blades, so working that when pushed along a corn-field at harvest-time, it cuts down the grain as if done by hand, and far more cheaply and expeditiously. His brother, a farmer, improves upon, and adopts this machine, and for a dozen successive years, employs it in reaping his crops. But it, also, is seen by few. The National Society gives the inventor a prize of £50, but makes little noise about it. Nobody cares to make a fortune by pushing it, and although, in 1834, several were in operation in Forfarshire, few of the supposed wide-awake Scotch farmers thought of adopting it as a saving of labour, even when the hardest times had come. But four of the machines were sent to New York from Dundee, the chief place of manufacture. Thoughtful, pushing emigrants, settlers in the North American prairies, where wide flat fields, easily covered with waving corn, offered speedy fortunes to those who could command hands to reap it, saw, or heard, or read of these machines. The reaper was re-constructed, modified in different ways, as so complicated a machine could not fail to be, and probably for the better, by ingenious mechanics, was brought into successful operation, made by thousands for the farmers beyond the American lakes, and obtained a deservedly high reputation, as a means both of doing work well and of saving labour much. In 1849 we saw it at the great State Show in Western New York, and brought it thence to London in 1851. The *American* reaping-machine proved the main attraction of the United States department of the Great Exhibition. Implement-makers vied with each other in seeking to secure the privilege of manufacturing the patented machines for the English market; thousands of practical men became persuaded of its economical applicability to our English soil and crops; hundreds of machines were bespoken by English cultivators, and all the while no one knew that the original model machine was at the very time quietly cutting its yearly harvest on the farm of Inch Michael, in the carse of Gowrie.—*Edinburgh Review.*

Vegetable Sports—Supposed Origin of Wheat.—Some 14 or 15 years ago, Monsieur Esprit Fabre, a continental botanist of great eminence, met with a plant of the *Ægilops ovata*, or common Sicilian grass, presenting features of difference to him sufficiently marked to lead him to conclude that it was an accidental variety. He took the seeds of this plant and sowed them. The produce of this seed of the original plant exhibited still greater departure from that original than the produce of the first year. He dealt with the seed of the second year as he had done with that of the first; and so on from year to year, from 1839 to 1851; and the result of this experiment was that the *Ægilops ovata* was turned into beautiful wheat. The plant had lost all affinity with the character of the plant from which it sprung, and had assumed a new type and form; thus demonstrating that the most useful and valuable of cereal products is in fact nothing more or less than a sport from *Ægilops ovata.*

The Potato Disease.—At a late sitting of the Academy of Sciences, M. Brierre stated that, having noticed that the potato blight did not occur on lands that had been covered by the sea, he made a strong solution of salt in water, and placed the cuttings in it for some hours before planting, the result being perfect freedom from disease. At the same meeting, M. Bayard, of Chateau Gouttier, averred that the blight was owing to excessive vitality in the plant; and that, therefore, before setting, he had inserted a pea into each cutting; both plants, the graft and the potato, flourishing most healthily. As the pea vegetated first, M. Bayard supposes it carried off the superabundant moisture of the

potato, and thus saved it from disease. He, in fact, acted on the principle of counteraction by means of the issue, using a pea instead of the orange-bud.

The Potato Disease, and Cutting off the Haulm.—I lately paid a visit to Mr. Diplock, of the Griffininn, Fletching, which I have done for three years in succession; and as Mr. D. has been very successful with his potatoes, not having one diseased tuber for the last three years, while his neighbours around him have had to deplore nearly the entire loss of theirs, I give you the mode whereby he prevents the ravages of the malady. As soon as the slightest symptoms of disease are manifested in the leaf, and before it has reached the stem, Mr. D. has the tops cut off close to the soil, at the same time in passing he presses in with his foot the top left behind; they are then thickly earthed over to prevent bleeding; and if the soil is observed to be damp a few days after, a fresh coat of soil is added. It is to the preventing of the bleeding that Mr. D. attributes his success, as he finds by this mode that the potatoes swell and grow as usual, while those left uncovered become exhausted by bleeding, and grow no larger. Mr. Diplock has now a fine healthy crop of potatoes, and not a diseased tuber among them, while every other grower in this neighbourhood finds theirs more or less diseased.—*Wm. Wood, Woodlands Nursery, Meresfield, near Ukefied, Sussex.*

The Effects of Liquid Manure.—An extensive landed proprietor, in Ayrshire, writes us (the *Glasgow Daily Mail*):—"You say that twenty sheep can be kept on an acre of Italian rye-grass. I know that many more than that number can be kept on a Scotch acre of it. At present there are about seventy sheep, of about twenty pounds a quarter, fed on a Scotch acre of Italian rye-grass per month. When first put up in the pens, within doors, each sheep eats twelve pounds per day of Italian rye-grass and half a pound of rape-cake; but as they take on fat they gradually fall off eating as much per day of the Italian rye-grass, and can consume not more than eight pounds per day. It is quite wonderful what a quantity of Italian rye-grass, watered with the liquid manure, can be cut from a Scotch acre. It can be cut four times in the year, and the weight of the four cuts is upwards of forty tons of moist Italian rye-grass."

CORRESPONDENCE.

Correspondence relative to the establishment of communication between the Society of Arts, Manufactures and Commerce (of London,) and the Canadian Institute, with a view to advancing the knowledge of the resources and capabilities of Canada abroad, and of promoting information on the same subject within this Province.

Copy of a Letter from the Secretary of the Colonial Committee of the Society of Arts, to the Corresponding Secretary of the Canadian Institute:

Sir,—I am instructed by the Colonial Committee of the Society of Arts, to acknowledge the receipt of your letter of the 31st July, *(see August No. of Canadian Journal,)* and the various papers which accompanied it, transmitted to the Right Hon. Sir J. Pakington. The Committee are much gratified by the cordial promise of co-operation with which their proposal has been met by the Council of the Canadian Institute and trust that the correspondence thus commenced will hereafter lead to important practical results.

The Committee consider in the first instance that it would greatly facilitate future enquiries if you would be so good as to have a general list of natural productions and raw produce of Canada prepared and sent to me. This list should include as far as possible, the name of every substance, whether mineral, vegetable, or animal, occurring or being produced in the colony, whether used or known in commerce, or not, indeed it is in fact even more important that the list should include the latter than the former, as the chief object which the Committee have in view is, to become acquainted with those productions which are not yet known in commerce. It would be of advantage if in the enumeration of these substances the local or native names were given, in addition to the English or European ones, accompanied by memoranda of any uses to which the substances are applied and of the probable facility with which they could be supplied in large quantities should a demand arise. If there are, however, any productions, not at present articles of commerce, the value of which you are desirous of having ascertained, I am desired to invite you at once to send them over to the Society, and they shall immediately be brought under the notice of competent persons for practical examination and report; as in so doing it is far more satisfactory to make trial of any new substance on a manufacturing scale, it will greatly facilitate the labours of the Committee if you will send large samples, say of at least a half a hundred weight of any gum, resin, oil, dye-stuffs, fibre, ornamental wood, and at least ten pounds of any metallic ore or stone.

I am, Sir,
Your's very faithfully,
EDWARD SOLLY, *Secretary.*

F. Cumberland, Esq.,
Canadian Institute, Toronto.

REVIEWS.

Geological Survey of Canada. Report of Progress for the years 1850-51. *John Lovell: Quebec.*

Another of Mr. Logan's admirable Reports of Progress made in the Geological Survey of Canada has reached us. Mr. Logan's absence from the Provinces during the year 1850-51 for the purpose of superintending the arrangement of the collection of economic materials forwarded from Canada to the Exhibition of the Industry of all Nations in London, prevented him from reporting at the usual time; and owing to the expiration of the Provincial Act of 1845, making provision for the survey, and the unavoidable lapse of time before it could be renewed, the season available for field exploration was considerably curtailed. Notwithstanding the drawback last mentioned, the Report contains some highly interesting information, and shows that considerable progress has been made in some of the important details of the survey. The subject of the distribution of gold possesses much attraction at the present period, and in its relation to Canada has received due attention from Mr. Logan. We append that part of his Report which relates to this important subject:—

"In the Report of Progress preceding this, mention is made of a partial examination of the gold-bearing drift of the Chaudière. This examination was last season continued, and the facts resulting from it constitute the only additional topic to which I have to invite your Excellency's attention. The auriferous district was found to spread over an area probably comprising between 3000 and 4000 square miles. It appears to occupy nearly the whole of that part of the Province which lies on the south-east side of the prolongation of the Green Mountains into Canada, and extends to the boundary between the colony and the United States. Two general lines of exploration were followed: one of them up the Chaudière and Rivière du Loup, from the seigniory of St. Mary to the Province Line; and the other from Lake Etchemin to Sherbrooke, on the St. Francis. The former, running transverse to the rock ranges, measured about forty-five miles; and the latter, with them, about ninety miles. The transverse line was more closely examined than the other, and traces of the precious metal were met with at moderate intervals throughout the whole distance. They were not confined to the channels of the main streams merely, but those of various tributaries furnished indications sometimes for a considerable distance up.

"The lowest point in the valley of the Chaudière at which the drift yielded traces of gold was on a small stream, falling in on the left side of the river, not far within the south-eastern boundary of the seigniory of St. Mary. They were found to occur on four tributaries in the seigniory of St. Joseph, for distances of one and two miles from their mouths. One of these joins the main stream on the left bank. about a

quarter of a mile below the parish church, and the other three are on the right. The lowest of them is about two miles below the church; the next about the same distance above it; and the fourth is the Rivière des Plantes, about half a mile farther up, and near the south-eastern boundary of the seigniory. In Vaudreuil Beauce they were discovered on the Guillaume, much further up than previously stated, and on the Bras opposite to it. On this and some of its tributaries the metal was traced to the centre of the township of Tring, a distance of about twelve miles. Three other streams which yield it in Vaudreuil Beauce have heretofore been mentioned: they are the Ruisseau Lessard, Ruisseau du Moulin, and the Touffe des Pins, on which it was first discovered. In Aubert d'Isle it was found on the Famine and traced to Rarbottles Settlement, and beyond the seigniory into Waterford, a distance altogether of about ten miles. Some particles were obtained on the Ruisseau d'Arboise, about a mile above the Famine, and it was followed about three miles up the brook commonly called Pozer's Stream, in Aubert Gallion. On the Rivière du Loup, in addition to its occurrence in a multitude of spots,—in fact almost continuously from its mouth across Jersey and Marlow,—it was found in nearly all its tributary brooks, such as the Ladyfair, the Grande Conde, the Metgermet for four miles up, the Travellers Rest, the Portage, Kempt's Stream, Oliver's Stream for four miles up, and another stream between it and the boundary of the Province. Above the Loup, on the Chaudière, it occurred at successive intervals in twenty places in sixteen miles, as far as the south-western boundary of Dorset Township.

"The localities of its observed presence on the other line of exploration were on Lake Etchemin, and along the Famine in Aubert d'Isle, and Pozer's Stream in Aubert Gallion, towards Tring, and again on the St. Francis, in Dudswell, in Westbury, and near the joint corners of Westbury, Stoke, Eaton, and Ascott, as well as in this last township near Sherbrooke.

"It is not supposed that the limits of the auriferous district have been ascertained, but that it very probably extends much farther to the north-east and attains the valley of the river St. John, while to the south-west it is known to reach Vermont, and to be traceable at intervals through the United States, even, it is said, as far as Mexico. In its breadth, however, it does not appear to cross the range of mountains with which it runs parallel, and no traces of it have been met with on their north-western flank. The deposit in which the gold occurs is part of an ancient drift, probably marine, and supposed to be of higher antiquity than that which, from the extent to which it occupies the valley of the St. Lawrence and some of its tributaries, Mr. Desor, who has recently bestowed much attention on the detrital deposits of North America, is disposed to give the name of Lawrencian. In this, alluded to in various Reports as tertiary and post-tertiary, the remains of whales, seals, and two species of fish—the capeling and the lump-sucker—and many marine shells of those species still inhabiting the Gulf of St. Lawrence, are found. The shells on the Mountain of Montreal attain a height of about 470 feet above tide level in Lake St. Peter, which is the greatest altitude known to me. None of the remains have yet been found in the Canadian gold drift; and as this appears in its lowest undisturbed parts to be at a height of about 500 feet above the sea, it is probable what is now exposed of it had emerged from the ocean before the Lawrencian drift was placed, while in lower levels it would be covered up by it.

"In the localities in which the gold occurs, the coarser materials of the drift are made up in a large degree of the debris of rocks similar to the clay slates and interstratified grey sandstones on which it rests; but these are accompanied by fragments and pebbles of fine conglomerate, talcose slate, and serpentine, which with magnetic, specular, chromic, and titaniferous iron (none of them absent when the gold is present), are derived from the mountain range, bounding it on the north-west; pebbles and fragments of white quartz are abundant, which may be derived from veins of the mineral prevailing in the mountain range, or from others on the south-east of it. With these materials there occasionally occur in the valley of the Chaudière and its tributaries large boulders of limestone conglomerate, similar to the beds of St. Giles and St. Mary; and more rarely of gneiss, identical in character with known kinds of the rock on the north side of the St. Lawrence. Not only is the gold absent from the drift on the north-west flank of the mountain range, but also are the chromic iron and the serpentine, notwithstanding that the two have been traced in association 135 miles, constituting a marked band accompanying the range from Potton to Cranbourne. On the north-west flank, however, boulders of northern gneiss are frequent; and a few of limestone have been met with even pretty high up on the hills: showing by their fossils their derivation from the Trenton limestone, the nearest exposures of which are on the north side of the St. Lawrence. In fact, in respect to the drift of the whole country, it may be said, that on southern foundations are found resting the ruins of northern; but no northern rocks are met with overlaid to any extent by debris derivable exclusively from southern. The auriferous drift shows no exception to this; and there is little doubt that causes connected with northern currents, when the rocks were beneath the surface of an ocean, have placed the whole. Ever since the surface however has risen from beneath this ocean, causes similar to those now in operation in the district have been working in a contrary course. The rivers of the district emptying into the St. Lawrence, flow north: in so far, therefore, as their forces modify the distribution of the drift, the materials of which it is composed are carried in that direction. This, no doubt, has some effect on the finer and lighter materials, and occasionally, with the assistance of ice and great freshets, on some of the coarser and heavier; but the streams, washing away the former in larger proportions than the latter, concentrate these in the valleys and channels; the gold, being the heaviest substance, is moved the least. It may occasionally be pushed along the bottom when this is smooth, but it seeks every hole and crevice in its course, and when it has once obtained shelter there it remains protected. Where the edges of the slates come to the surface, the plates have all been moved by superficial forces, and they therefore lie more or less loosely on one another, and the fine particles of gold gradually work themselves down between them, reaching sometimes as deep as three feet.

"Although it is probable the whole of the drift on the south-east of the mountain range—both that in high and that in low places—may be auriferous, it appears certain that the metal will be most concentrated in the valleys and the channels of streams; and the larger the stream,—the more frequently it has broken down its banks,—the oftener and more extensively it has changed its course,—the more important the auriferous deposit is likely to be; and it is probably only in some such situations, if any where, that it will be worked to advantage. From the combination of the materials associated with the gold in the drift, there appears a strong probability that the metal is derived from quartz veins situated in the mountain range, through the agency of some southward-moving causes; and even if traces were found north of this range in the channels of the main streams, such as the Chaudière and the St. Francis, the circumstance would not militate against the supposition, as traces in such positions may be expected from the fluviatile remodification of the drift; but with the exception of one vein in talcose slate near Sherbooke, no auriferous quartz veins have yet been discovered; and in this one there was merely a trace of the metal, so that the facts of this gold district as yet offer no contradiction to Sir Roderick I. Murchison's theory that the gold, when it was originally placed in the veins, occupied only that part of them which was towards the then existing exterior of the earth's crust; and that this part, having been subsequently worn down by various destructive causes, the productive portion of the veins has been wholly or in a great degree removed, leaving only their more quartzose continuation behind in situ; while the gold, the vein stone, and the rock enclosing it have been carried away to form the drift. In this way it is his opinion that the drift will always be more productive than the veins; but whether this is to be borne out by the facts of California and Australia, remains yet to be proved.

"The object of this examination has not been so much to ascertain the quantity as distribution; but an effective experiment being now in operation on the Rivière du Loup, under a letter of license from the Government,—one condition of the lease being that a correct return shall be made of the quantity obtained,—I am in hopes by the end of the present season to have a few such facts as will afford some criterion to determine whether there is reasonable ground for supposing the deposit in that vicinity can be worked advantageously."

Mr. Murray's investigations, during the latter part of 1850, were carried on over a very large area. The determination of the boundaries of the several formations by which the Western Peninsula is underlaid, their geographical distribution in the interior, and the nature of the economic materials the various deposits contained, were among the chief objects of his laborious investigations.

Mr. Murray considers the whole of the Western Peninsula to be equal, if not to surpass, in its capabilities of soil and climate, any other part of British America, "as the rapidity with which it has been settled, the annual increase of its products, and the growth of its numerous towns and villages abundantly testify." Valuable economic materials are abundantly distributed throughout the part of the country visited by Mr. Murray, namely, the valley of the upper portion of the Grand River, the Speed, the Saugeen, &c., and their affluents. In the seventh concession of Nassagaweya there is a vertical precipice of encrinal limestone, varying from eighty to one hundred feet in height; and in Eramosa a branch of the Speed runs between vertical

and solid calcareous cliffs of sixty and eighty feet. The Credit, in Caledon, is flanked by similar cliffs; and in the valley of the Nottawasaga, in Mono, the same character prevails. Similar cliffs were observed in Mulmur and Nottawasaga, and in the valley of the Beaver river in Euphrasia and Artemesia the same limestone is at least 120 feet thick.

Mr. Murray goes on to state that huge caverns are sometimes found in this limestone, the roofs and floors being studded with small stalactitic incrustations.

The encrinal limestones are everywhere qualified to make a durable and handsome building stone; and in some parts, when sufficiently removed from atmospheric influences, might be used as a marble for common ornamental purposes. Most of its beds are likewise of good quality for burning lime.

Gypsiferous works were recognized in the Speed, the Irvine, and the Rocky Saugeen; and Mr. Murray observes, that "sharp conical hills and mounds, and large circular sinks or depressions, such as have been described in a former Report, are of frequent occurrence in the gypsiferous country, were observed in the township of Waterloo and in several parts of the Saugeen; and it is extremely probable that as improvement advances, and the hills are cut into where roads happen to intersect them, this useful mineral will eventually be found in many places."

"*Drift.*—It has already been remarked in the Report of 1843 that a great deposit of loose detrital material, consisting of clay, sand, gravel, and boulders, deeply conceals the older strata in a great many parts of Western Canada; and this remark is peculiarly applicable to the Peninsula between the Niagara Ridge and the St. Clair River. The lower portion of the more recent deposits, as exhibited on the shore of Lake Erie, where the cliffs are in many parts over 150 feet high, is a blue calcareous clay, frequently holding pebbles and small boulders of limestone, and small round fragments of granite or gneissoid rock. Clay of an ash-grey colour, when dried, but presenting a light brownish colour in the bed, succeeds the blue clay, and this again is overlaid by pale buff and occasionally yellowish tinged clay. Back from the lake these clays are capped with a stratum of sand, and the more elevated parts present beds of calcareous gravel.

"No organic remains of either marine or fresh-water origin have hitherto been observed among the superficial deposits of the Western Peninsula, with the exception of the shells which constitute the fresh-water shell marls, and the impressions of leaves and moss which are frequently preserved in the tufaceous deposits around calcareous springs and on the banks of rivulets, both of which are evidently of very recent origin. The marls are only found immediately below the vegetable mould, and contain only shells common to almost all the lakes and rivers of the present day; and in the accumulations of calcareous tufa the impressions are only of such plants as now grow in the immediate vicinity of the springs and brooks, to which the deposits owe their origin.

"The materials of economic importance, connected with the superficial deposits, are brick clays, bog iron ore, shell marl, calcareous tufa, and peat.

"All the clays are more or less calcareous; but some portions of the deposit are, nevertheless, admirably adapted for the manufacture of bricks, and are used for that purpose over a great part of the northern country.

"Bog iron ore is found in many parts of the country in greater or less abundance, along the edges of marshes or on the marshy banks of streams. It usually occurs in rough, irregular, detached masses, and of all sizes under one foot diameter, generally deposited on clay, and concealed by vegetable mould and marsh grasses.

"Fresh-water shell marls were observed at several places in the new townships of Bentinck and Brant. One bed, extending over between two and three acres, with a thickness varying from three inches to one foot, occurs on the property of Mr. Jackson, on the nineteenth lot of the first concession west of the Owen Sound Road, within a mile of the village of Durham. Another bed occurs on the fifty-ninth lot of the first concession south in Bentinck, on the Durham Road, the extent of which was not exactly ascertained, but it shews a thickness in several places on the side of the road of not less than two feet. A third bed was seen on the seventieth or seventy-first lot of the first concession south of the Durham Road in Brant; this bed is exhibited in the banks and on the bottom of a small tributary of the Saugeen, near its junction with that river, and is in some parts fully three feet in thickness. Indications of the presence of the same substance were observed likewise near the junction of the Rocky Saugeen and the main stream; and it is probable that it will be found to exist in many other parts of the region, where its value as manure will doubtless be sufficiently appreciated as the settlement advances in improvement.

"These marls, which are almost entirely composed of an aggregate of comminuted fresh-water shells, are usually concealed by a rich black vegetable mould or peat. The ground is usually swampy and sometimes assumes somewhat the character of prairie land. I was informed of some instances in which the peat is sufficiently thick and free from earthy matter to be available as a fuel, but none of these came within my observation.

"In respect to the tufa, none of the deposits that came within my notice were of sufficient importance to be deemed of economic value; but indications of it were met with on the banks of many springs and streams; and in consequence of the calcareous nature of the soil, and the adjacent rocks in so great an extent of the Western Peninsula, large deposits of it may be looked for. The material is applicable as a mineral manure, and may be resorted to for lime for mortar.

"Springs of petroleum, commonly known in the country by the designation of *oil springs*, rise in the River Thames, near its right bank, on the twenty-eighth and twenty-ninth lots of the first range of Mosa, where the bituminous oil is frequently collected on cloths from off the surface of the water, and is very generally used in the neighbourhood as a remedy for cuts and cutaneous diseases in horses. Similar springs are known to exist in the township of Enniskillen, and a deposit of mineral pitch or mineral caoutchouc is said to extend over several acres on the seventeenth lot of the second concession of the township."

The Report of T. S. Hunt, Esq., Chemist and Mineralogist to the Provincial Geological Survey, follows that of the Assistant Geologist. Mr. Hunt gives the analysis of several felspathic minerals, which were first discovered in Canada by that indefatigable collector, Dr. Wilson of Perth, and Dr. A. R. Holmes of Montreal, and first analyzed by Dr. Thomson of Glasgow. *Perthite*, Mr. Hunt states, is of the same composition as *Orthoclase*; *Peristerite* he shows to be *Albite*; *Bytownite* to be identified with *Anorthite*; *Pretinalite* a compact *Marmolite*. These minerals, suggested by Dr. Thomson to be new species, are thus found to be identical with previously described varieties. Mr. Hunt has however succeeded in discovering a new mineral, which he found in a mass of lime-stone, exposed in constructing the timber slides on the Ottawa, near the Grand Calumet. He has very appropriately named it *Loganite*.

We have not space to advert to Mr. Hunt's admirable series of analyses of mineral waters, with which the Geological Reports for the last two or three years have been enriched. We can only say, in conclusion, that the Reports are of the highest value to the commercial and scientific interests of this Province; and while they reflect great credit upon the Government which provides the means for the prosecution of the researches they detail, they will be a lasting record of the indefatigable industry and rare talent of the gentlemen engaged in the arduous work of discovering and describing the geological treasures of Canada.

American Journal of Science and Arts.—A. H. Armour & Co., Toronto.—This long established Journal, edited by Professor B. Silliman, B. Silliman, jr., and J. D. Dana, aided by Dr. Wolcott Gibbs in Chemistry and Physics, and Professor Asa Gray in Botany, is published at New Haven, Ct., in numbers of 152 pages each, every two months, commencing each year with January, making two volumes a year.—Price, $5 a year in advance,

The work embraces in its range, the departments of Chemistry, Physics, Geology, Mineralogy, and the other natural sciences. Meteorology, Astronomy, and collateral branches, with their practical applications. Each number contains various original Memoirs, besides extended selections from the scientific Journals of the other Continent,

and a general exposition of the progress of science in its several departments.

This Journal was established in 1819 by Professor Silliman, and has reached its 34th year. A Second Series was commenced, January, 1846, and the 15th volume of the new series begins with the number for January, 1853. We commend this Journal to the attention and substantial support of all friends of science.

SCIENTIFIC INTELLIGENCE.

"On the Optical Properties of a recently-discovered Salt of Quinine," *by Prof. Stokes.*—This salt is described by Dr. Herapath in the Philosophical Magazine, and is easily formed in the way there recommended namely, by dissolving disulphate of quinine in warm acetic acid, adding a few drops of a solution of iodine in alcohol, and allowing the liquid to cool; when the salt crystallizes in thin scales, reflecting (while immersed in the fluid) a green light with a metallic lustre. When taken out of the fluid the crystals are yellowish green by reflected light, with a metallic aspect. The following observations were made with small crystals formed in this manner:—The crystals possess in an eminent degree the property of polarizing light, so that Dr. Herapath proposed to employ them instead of tourmalines, for which they would form an admirable substitute, could they be obtained in sufficient size. They appear to belong to the prismatic system: at any rate, they are symmetrical (so far as relates to their optical properties and to the directions of their lateral faces) with respect to two rectangular planes perpendicular to the scales. These planes will here be called respectively the *principal plane of the length* and the *principal plane of the breadth*, the crystals being usually longest in the direction of the former plane. When the crystals are viewed by light directly transmitted, which is either polarized before incidence or analyzed after transmission, so as to retain only light polarized in one of the principal planes, it is found that with respect to light polarized in the principal plane of the length the crystals are transparent and nearly colourless,—at least when they are as thin as those which are usually formed by the method above mentioned. But with respect to light polarized in the principal plane of the breadth, the thicker crystals are perfectly black, the thinner ones only transmitting light, which is of a deep red colour. When the crystals are examined by the light reflected at the smallest angle with which the observation is practicable, and the reflected light is analyzed, so as to retain,—first, light polarized in the length, and secondly, light polarized in the other principal plane,—it is found that in the first case the crystals have a vitreous lustre, and the reflected light is colourless, while in the second case the light is yellowish green, and the crystals have a metallic lustre. When the plane of incidence is the principal plane of the length, and the angle of incidence is increased from 0° to 90°, the part of the reflected pencil which is polarized in the plane of incidence undergoes no remarkable change, except perhaps that the lustre becomes somewhat metallic. When the part which is polarized in a plane perpendicular to the former is examined, it is found that the crystals have no angle of polarization, the reflected light never vanishing, but only changing its colour, passing from yellowish green, which it was at first, to a deep steel blue, which colour it assumes at a considerable angle of incidence. When the light reflected in the principal plane of the breadth is examined in a similar manner, the pencil which is polarized in the plane of incidence undergoes no remarkable change, continuing to have the appearance of being reflected from a metal, while the other or colourless pencil vanishes at a certain angle and afterwards reappears, so that in this plane the crystals have a polarizing angle. If then, for distinction's sake, we call the two pencils which the crystals, as belonging to a doubly refracting medium, transmit independently of each other, *ordinary* and *extraordinary*, the former being that which is transmitted with little loss, we may say, speaking approximatively, that the medium is transparent with respect to the ordinary ray, and opaque with respect to the extraordinary; while as regards reflexion, the crystals have the properties of a transparent medium or of a metal according as the refracted ray is the ordinary or the extraordinary. If common light merely be used, both refracted pencils are produced, and the corresponding reflected pencils are mixed together; but by analyzing the reflected light, by means of a Nicol's prism, the reflected pencils may be viewed separately,—at least when the observations are confined to the principal planes. The crystals are no doubt biaxal, and the pencils here called ordinary and extraordinary are those which in the language of theory correspond to different sheets of the wave surface. The reflecting properties of the crystals may be embraced in one view, by regarding the medium as not only doubly refracting and doubly absorbing, but *doubly metallic*. The *metallicity*, so to speak, of the medium of course alters continuously with the point of the wave surface to which the pencil considered belongs, and doubtless is not mathematically null even for the ordinary ray. If the reflection be really of a metallic nature, it ought to produce a relative change in the phases of vibration of light polarized in and perpendicularly to the plane of incidence. This conclusion the author has verified by means of the effect produced on the rings of calcareous spar. Since the crystals were too small for individual examination in this experiment, the observation was made with a mass of scales deposited on a flat black surface, and arranged at random as regards the azimuth of their principal planes. The direction of the change is the same as in the case of a metal, and accordingly the reverse of that which is observed in total internal reflection. In the case of the extraordinary pencil the crystals are least opaque with respect to red light, and accordingly they are less metallic with respect to red light than to light of higher refrangibility. This is shown by the green colour of the reflected light when the crystals are immersed in fluid; so that the reflexion which they exhibit as a transparent medium is in a good measure destroyed. The author has examined the crystals for a change of refrangibility, and found that they do not exhibit it. Safflower red, which possesses metallic optical properties, does change the refrangibility of a portion of the incident light; but the yellowish green light which this substance reflects is really due to its metallicity, and not to the change of refrangibility, for the light emitted from the latter cause is red, besides which it is totally different in other respects from regularly reflected light. In conclusion, the author observed that the general fact of the reflection of coloured polarized pencils had been discovered by Sir David Brewster in the case of chrysammate of potash;* and in a subsequent communication he had noticed in the case of other crystals the difference of effect depending upon the azimuth of the plane of incidence.† Accordingly, the object of the present communication was merely to point out the intimate connexion which exists (at least in the case of the salt of quinine) between the coloured reflection, the double absorption, and the metallic properties of the medium.

Specimens of Sensitive Media were exhibited by Professor Stokes. These were:—a crystal of green fluor spar, which, by the developement of blue light within it, changed its colour;—the solution of the common disulphate of quinine in acidulated water, which, by its action on the invisible rays developed blue light; and the solution of the green colouring matter of leaves in alcohol, which by a similar action became blood red.

Reduction of Metals by Phosphorus and Sulphur.—It had been observed by Woehler that phosphorus in combination with copper excites an electrical current. M. Wicke has made the following observations:—

1. A stick of phosphorus wound round with a strip of silver was placed in a highly concentrated solution of nitrate of silver. The silver and phosphorus instantly became covered with a blackish film; afterwards silver began to be reduced in a wart-like form upon the strip of silver; and after the lapse of a few weeks it was covered with an extremely shining coating of crystalline silver, although not in immediate contact with the phosphorus. The whole of the reduced silver could be removed from the strip of silver as a compact coating with a shining inner surface. The phosphorus was only covered superficially with a thin coating of dark phosphuret of silver, and remained unchanged internally. The silver separated so evenly, and with such a shining surface, that this process might perhaps be employed for galvanoplastic purposes.

2. In a similar manner, by a combination of phosphorus and lead in a solution of nitrate of lead, the reduction of crystallized lead took place upon the lead, whilst the phosphorus was covered with a thin black film; the action, however, was weak, and soon stopped altogether.

3. A stick of phosphorus was placed on the axis of a closely-pressed mass of oxide of copper, both covered with water, with which the tube was filled, and then made air-tight; the reduction of the oxide to metallic copper was gradually effected, so that after several weeks the stick of phosphorus, which was still remaining, was surrounded by a capsule of crystalline copper.

4. Sulphur, surrounded with a strip of lead, and laid in solution of nitrate of lead, effected the reduction of lead upon the lead in form of a loose crystalline coating.

5. When a piece of sulphur, surrounded with a bright copper wire, was laid in a saturated solution of sulphate of copper, it became covered after some time, in the place where the copper touched it, with a loose crystalline coating of indigo-coloured sulphuret of copper, whilst the copper wire was dissolved. A solution of nitrate of copper

* Report of the Meeting of the British Association at Southampton in 1846, Part II., p. 7.

† Ditto Oxford, 1847.

acted still more rapidly. On the other hand, no action took place on the employment merely of dilute sulphuric acid.—*Artizan.*

The Cloves of Commerce.—The article known in commerce as cloves, are the unopened flowers of a small evergreen that resembles in appearance the laurel of the bay. It is a native of the Molucca, or Spice Islands, but has been carried to all the warmer parts of the world, and is largely cultivated in the tropical regions of America. The flowers are small in size, and grow in large numbers in clusters at the very ends of the branches. The cloves we use are the flowers gathered before they are opened, and whilst they are still green. After being gathered, they are smoked by a wood fire, and then dried in the sun. Each clove consists of two parts, a round head, which is the four petals or leaves of the flower rolled up, inclosing a number of small stalks or filaments. The other part of the clove is terminated with four points, and is, in fact, the flower-cup, and the unripe seed-vessel. All these parts may be distinctly shown if a few leaves are soaked for a short time in hot water, when the leaves of the flower soften, and readily unroll. The smell of cloves is very strong and aromatic, but not unpleasant. Their taste is pungent, acrid, and lasting. Both the taste and smell depend on the quantity of oil they contain. Sometimes the oil is separated from the cloves before they are sold, and the odor and taste in consequence is much weakened by this proceeding.

Liquid Glue.—*By M. Sc. Dumoulin.*—Chemists well know that heating and cooling repeatedly a solution of glue (gelatine) in contact with the air, it loses its property of becoming a jelly. M. Gemelin has shown, that a solution of fish-glue in a sealed tube, placed in a water bath heated to the boiling point for several days, exhibits the same phenomenon i.e, the glue remains liquid, does not gelatinize upon cooling.

The change effected, is one of the most difficult problems to resolve, of organic chemistry. It appears to be a product of the action of the oxygen of the air and the water, upon the glue as demonstrated from the action of a small quantity of nitric acid, on a solution of strong glue. We know that on treating gelatine with an excess of this acid in the presence of heat, it is converted into malic and oxalic acids, fat, tannin, &c. This does not occur when we treat the glue dissolved in its weight of water, with a very small quantity of nitric acid, we obtain only a strong glue which preserves a long time its primitive qualities, and which no longer has the property of gelatinizing. In this manner the glue sold in France under the name of liquid and unchangeable glue, is fabricated. This glue is exceedingly convenient for cabinet-makers, joiners, pasteboard manufacturers, toy-makers, &c., since it can be used cold. It is prepared as follows:—

Dissolve 2 pounds of strong glue in one quart of water in a glue-kettle, or in a water-bath, when the glue is entirely melted, add little by little, to the amount of 10 ounces of strong nitric acid. This addition produces an effervescence due to the disengagement of hypo-nitric acid, when the whole of the acid is added, remove the vessel from the fire, and leave it to cool. I have preserved glue thus prepared, more than two years in a stoppered flask, without its undergoing any alteration. This liquid glue is very convenient in chemical operations. I have employed it with advantage in my laboratory, for the preservation of different gasses, the same as lute, covering the little bands of linen with the glue.—*Comptus Rendus*, Sept. 27, 1852.

The liquid glue prepared as above directed, we can recommend from our own experience; it is readily and cheaply made, and must prove an invaluable substitute for solutions of gum-arabic, paste, &c. The proportions mentioned are those best adapted for ordinary use, one need not however be very particular on this point. If the glue should gelatinize in the cold, the slightest warmth will liquefy it again.—*Br.Pa.*

Preservation of Eggs.—*By M. P. Chambordt.*—By submitting a thin stratum of the white and yoke of eggs, about one-twelfth of an in. thick, upon glass or porcelain plates, to the heat of an oven, a mass will be obtained after 24 hours drying, readily pulverized, and which is not altered by the action of the air after drying again a day. Each pound of powdered egg thus prepared, when desired for use requires two pounds of cold water, with which it is to be beaten up, and is equivalent to 50 eggs, and may be used for omelettes, pastries, or other culinary purposes.—*Belgique Industrielle.*

The New Railway Locomotive.—*Mr. McConnell's, by Fairbairn, of Manchester.*—The first experimental trip made with this locomotive on the London and North-Western line, from Wolverton to London, was perfectly satisfactory, and no doubt was entertained that the distance from London to Birmingham could easily be accomplished in the time suggested—two hours. The engine being new, the highest speed obtained was 60 miles per hour. One peculiar novelty is that the steam pipe presents a broad flat surface to the heated air as it passes the tubes, so that it is "dried" as it passes into the cylinder. The pistons and rods are in one piece of wrought-iron, thus diminishing the weight from 3 to 2 cwts., reducing the reciprocating resistance at a velocity of 60 miles per hour, from 140 tons to about 90 tons per minute. The springs are of India-rubber, on Coleman's patent; it has a Bourdon's steam-pressure meter, showing the pressure of steam in the boiler; and a Carrett and Marshall's steam-pump, to enable the driver to supply the boiler when not in motion. The cylinder-covers are of wrought-iron, only half the usual weight; and the axles are tubular, reducing the weight one-third.

New Method of Propelling Vessels.—Professor A. Crestadoro has just secured, under the new patent law, an interesting scheme for propelling vessels. He considers the use of paddles or blades to be a mistake similar to that which prevailed so long in the application of locomotives or railroads, and which materially retarded the progress of that invention, when, taking for granted the inability of the plain circumference of the wheels to propel the carriage, much labour and skill had been wasted in the contrivance of levers which acted on the road in a manner somewhat resembling the feet of horses. Now, as the apprehended insufficiency of the adhesion of the plain circumference of the wheels with the road to propel the carriage has been proved a fallacy, so he considers the necessity of paddles or blades, of whatever description they may be, as altogether fallacious, and that the best and cheapest mode of improving the propeller is to use simply the plain circumference of cylindrical drums. It is a natural supposition that a plain round surface should have no tractic adhesion with the water; but, on close examination it will be found that not only such is not the case, but, what is even more surprising, the tractic adhesion of a plain cylindrical drum is far greater than that of a paddle wheel of equal size. Taking for instance the steam-vessel Atlantic, whose paddle-wheels are of 35 feet diameter, and length of paddles 12 feet 6 inches, supposing a moderate immersion of 5 feet paddles—one pair of drums of equal size at equal immersion would displace a pair of cubic segments of about 135631 lbs. of water; or, what amounts to the same thing, a pressure of not less than 60 tons would act upon the drums as a tractic adhesion, which is by far superior to that afforded by the best method of paddle-wheels in the most favourable circumstances. Now the cylindrical propeller has the substantial advantage that it can be, when reduced to a moderate diameter, applied as well totally immersed, if it be (as proposed by the patentee) fitted into a semi-cylindrical case, with only such a clearance as is just sufficient to let the drum have a proper action, the other half-drum or semi-cylinder projecting out of the case for the propelling action.—*European Times, (Liverpool,) Nov.* 12, 1852.

New System of Manufacturing Sugar.

We have been favoured, says the London *Times*, with an opportunity of witnessing an improved process for making sugar, recently invented and put in operation by Mr. H. Bessemer, civil engineer, at his premises, Baxter-house, Old St. Pancras-road, and, in common with several gentlemen practically conversant with the subject who were present, have to express the high gratification we experienced at the results brought under our notice. In the present condition of our West India colonies every improvement in the manufacture of sugar, and everything that tends to cheapen its production, cannot fail to excite interest; and a brief description of this new process may not therefore be unacceptable to the reader. This we shall attempt to do in language as free from technicalities as the nature of the subject will admit of. In the manufacture of sugar from the cane the saccharine juice is by the usual system expressed by a roller-mill, which, on an average, obtains from 50 to 55 per cent. of juice; whereas the cane, according to the most eminent writers, contains 90 per cent., the remaining 35 or 40 per cent. being left in the "cane trash." Mr. Bessemer, by a great improvement on his original invention of the cane-press, is now enabled to obtain, by a principal of continuous pressure, from 75 to 80 per cent. without any additional cost. In order to produce granulated sugar from the juice of the cane, it is necessary to separate a large portion of the water in which the saccharine matter is held in solution. This has hitherto been effected by boiling, the water passing off in the form of steam. It has, however, been discovered, that the heat necessary to produce ebullition effects a rapid chemical decomposition of a large portion of the sugar under operation, which assumes a dark brown or blackish colour, and is perfectly uncrystallizable, in which condition sugar is commonly known under the name of molasses or treacle, and amounts to 40 per cent. of the entire quantity of saccharine matter present in the juice. In the new process just patented by Mr. Bessemer, this separation of the aqueous portion of the fluid is no longer effected by boiling, but is dependent on that beautiful law of nature by which evaporation is carried on spontaneously, and every shower of rain again vaporized, and caused to ascend in the atmosphere. To carry this into practice, a small pan only is required, in which is placed a screw of peculiar construction, presenting about 6,000 superficial feet of surface, which is kept wetted by slowly revolving in the fluid to be evaporated; and in contact with this wet surface some 10,000 cubic feet of warm atmospheric air is forced per minute by a common blowing fan. The aqueous portions of the solution are thus rapidly absorbed by the air, and pass off as a perfectly invisible vapor, while the temperature of the fluid is only 110 degrees Fahrenheit. The most remarkable fact is that the evaporation at this low temperature is equal to that of firepans of the same dimensions with a powerful fire beneath them. A vast amount of fuel is thus saved; and a still more important result obtained from

evaporating at this low temperature is, that none of the saccharine matter is converted into molasses, nor is there the least perceptible increase of colour. Hence, not only is the quantity increased in this single process 40 per cent., but the superior quality of it would command 7s. or 8s. per cwt. in the market over the ordinary colonial produce. In the usual mode of manufacturing sugar, after the crystallization has taken place, the "mother liquor," in which the crystals are formed, is separated by a very slow process of drainage through holes made in the bottom of the hogsheads; but as the whole of the dark viscid syrup will not drain out by the mere action of gravity, a coating is left upon the crystals, which render them brown and of less value. By another more important invention of Mr. Bessemer, this drainage is effected with extraordinary rapidity and perfection, by continuously passing a very thin stratum of sugar over a fine wire gauze surface, beneath which a partial vacuum is formed, and on which a number of fine jets of water (like a syringe) are allowed to flow; the passage of the water through the interstices between the crystals of sugar entirely removes the syrup from their surface, and renders them at once sufficiently dry for shipment. The time which the sugar is exposed to the action of the water is one-seventh of a second only, during which minute interval the water is drawn into the vacuum chamber, without being allowed sufficient time to dissolve any portion of the crystals. This instantaneous conversion of brown sugar into white must however be witnessed to be appreciated. These are the most striking as they are the most useful inventions applied by Mr. Bessemer to the manufacturing of sugar, though there are a variety of other important details, a description of which seems less called for. We understand the improvements have received the approbation of numerous scientific and practical men, several of whom have expressed their opinion that their adoption will be one of the first steps towards the restoration of that prosperity which has been so long withheld from our sugar-growing colonies.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—November, 1852.

Latitude 43 *deg.* 39.4 *min. North. Longitude,* 79 *deg.* 21 *min. West. Elevation above Lake Ontario :* 108 *feet*

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch.	S'nw in Inch.
						°	°	°														
cd	1	29.440	29.375	29.250	29. 345	34.8	50 4	40.4	43.97	0.185	0.289	0.277	0.257	92	81	92	89	Calm.	S S E	NE	0.145	- -
b	2	.059	28.986	.203	. 086	43 4	46.7	43.9	43.40	.249	.271	.226	.249	90	86	89	89	N E	N	W N W	0.090	- -
c	3	.429	29.572	.698	. 585	37.3	45.4	30.8	40.45	.193	.175	.187	.183	87	58	80	74	W b S	W b S	W	0.040	- -
c	4	.742	.697	.726	. 727	38 1	45.6	4[illegible].2	41 02	.199	.240	.195	.212	87	80	79	83	Calm.	S S W	Calm	- -	- -
c	5	.691	.662	.683	. 674	38.1	43.0	38.1	39.23	.182	.177	.161	.172	79	65	71	72	N N E	E	NE	Inap	- -
bd	6	.514	.222	.015	. 228	37.8	40.4	43.4	41.02	.177	.232	.264	.229	79	94	94	89	E N E	E	N E b E	0.545	- -
ad	7	.083	.188			40.1	43.0			.162	.177			66	65			S W b W	W S W	W S W	Inap	- -
a	8	.573	.653	.687	. 663	34.9	41.5	37.0	37.80	.192	.192	.190	.191	95	74	87	85	W b S	W b S	N N W	Inap	- -
b	9	.659	.620	.675	. 654	35 2	39.3	31.2	35.37	.197	.193	.160	.185	96	81	92	90	Calm	W b S	W b S	Inap	- -
ac	10	731	.819	.870	. 816	28.4	40.6	33.0	34 52	.141	.181	.155	.164	90	72	82	82	W	NN W	N b E	Inap	- -
e	11	.882	.745	.420	. 656	32 3	40.7	43.8	38.93	.176	.163	.243	.193	96	65	86	81	N E	E S E	S E b E	0.050	Inap
e	12	.179	.254	.477	. 324	41.7	40.1	35.2	37.90	.242	.163	.151	.170	93	66	74	74	W b S	SW b W	W b N	- -	Inap
cd	13	.425	.516	.458	. 478	32.7	35.9	31.3	32.93	.174	.139	.154	.154	94	67	88	83	W	NW	NW	- -	0 4
c	14	.324	.395			29.2	31.5			.148	.158			93	89			NW b N	NW b N	N W b W	- -	Inap
b	15	.460	.478	.491	. 477	31 3	34.3	30 9	32.33	.164	.136	.157	.154	94	69	91	85	N W	NW bW	W b N	- -	- -
c	16	.470	.433	.483	. 467	30 7	36.0	29.6	31.70	.157	.142	.157	.158	92	67	96	89	W S W	W S W	SW bW	- -	- -
c	17	.509	.511	.554	. 524	27.1	37.9	29.7	31.32	.138	.134	.136	.136	93	59	82	78	W S W	W b S	W N W	- -	- -
b	18	.551	.591	.684	. 623	25.5	39.5	34.2	34 30	.129	.142	.149	.151	92	59	75	77	N	NW b N	N N E	- -	- -
a	19	.731	.735	.802	. 760	32.5	39.6	29.1	33.48	.170	.175	.155	.163	93	73	96	86	N b E	S b E	N b W	- -	- -
a	20	.868	.950	30.048	. 963	32.5	40.2	32.7	35.05	.159	.123	.139	.145	87	50	75	73	N b W	NN W	N W b N	- -	- -
a	21	30.120	30.081			32.1	33.7			.169	.166			94	86			N N W	N E b E	E N E	- -	- -
b	22	29.857	29.666	29.545	. 678	33.9	32 7	33.4	33.37	.165	.168	.174	.168	84	91	92	88	E b S	E	E b S	- -	0.8
b	23	.6[illegible]3	.763	.929	. 792	29.8	32 1	23.6	27.85	.141	.143	.100	.124	85	79	76	79	N N E	N N E	N E b N	- -	- -
b	24	.963	.846	.700	. 835	19 0	27.0	31.3	25.65	.087	.131	.154	.123	81	88	88	85	N E b N	N E b E	E b S	- -	Inap
bc	25	.473	.343	.285	. 352	33 7	37.5	38.4	36.43	.166	.197	.211	.194	86	88	92	91	E b S	E b S	N E b E	0.570	- -
e	26	.075	28.943	.064	. 021	39.1	42.4	38.4	39.93	.222	.255	.215	.230	93	96	95	94	E b S	E S E	W S W	0.335	- -
bc	27	.112	29.248	.539	. 332	34.8	38.1	33.0	34.87	.185	.154	.133	.151	92	68	72	75	W S W	W b S	W S W	- -	- -
b	28	.765	.800			32.8	38.3			.145	.152			78	66			SW b W	SW b W	S W	- -	0.8
a	29	.831	.857	30.003	. 906	33.0	38.1	29.9	32 90	.161	.177	.131	.153	86	78	78	82	W b N	W b S	W b N	- -	- -
bd	30	30.016	.907	29.913	. 944	27.1	42.9	36.3	35.00	.123	.198	.168	.160	82	72	79	78	W	W S W	W S W	- -	- -
	M	29.572	29 553	29.585	29 5734	33 26	39.53	34 95	35 80	0.172	0.180	0.175	0.176	89	74	85	83	Ml's 6.10	Ml's 7.96	Ml's 5.62	1.775	2.0

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1391.26	2327.69	827.59	1378.64

Mean velocity of the wind - - - 6.50 miles per hour.
Maximum velocity - - - - - 19.5 ml's per h'r, from 2 to 3 p m. on 27th.
Most windy day - - - - - 12th: Mean velocity, 13.91 miles per hour.
Least windy day - - - - - 4th: Mean velocity, 2.11 ditto.
Most windy hour - - - - - noon: Mean velocity, 8.59 ditto.
Least windy hour - - - - - 9 p.m. Mean velocity, 5.34 ditto.
Mean diurnal variation - - - 3 25 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

(First snow storm of the season, from 6 to 9 A. M., on the 11th.)

Highest Barometer - - 30.184, at 8 A. M., on 21st } Monthly range:
Lowest Barometer - - 28.943, at 2 P.M., on 26th } 1.241 inches.

Highest observed Temp. - 50.4, at 2 P. M., on 1st } Monthly range:
Lowest regist'd Temp. - 18.2, at A.M., on 24th } 32.2
Mean Highest observed Temperature - - 39.66 } Mean daily range:
Mean Registered Minimum - - - - - 30.05 } 9.61
Greatest daily range - - - - - 20.4 from A.M., to 2 P.M., on 30th.
Warmest day - - 1st - - - Mean Temperature - 43.97 } Difference:
Coldest day - - - 24th - - - Mean Temperature - 25.65 } 18.32

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for November.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. D's	Inch's	Wind. Mean Velocity.
	°	°	°	°					Miles.
1840	35.90	54.4	20.5	33 9	5	1.220	8	not regis'd	--
1841	35.35	63.2	7.6	55.6	8	2.450	5		--
1842	33 12	50.6	7.6	43.0	9	5.310	10		--
1843	33 14	51.2	14.4	36.8	10	4.765	7	1.2	--
1844	34.82	49.8	12.0	37.8	8	imperfect	4	8.0	--
1845	36.67	58.8	7.6	51.2	7	1.105	4	5.0	--
1846	40.85	55 5	18 2	37.3	12	5.805	2	0.4	--
1847	38.72	58.2	7.8	50.4	14	3.155	3	Inapp	4.77
1848	34.31	49.3	16.5	32.8	9	2.020	3	1.4	4.81
1849	42.33	56.7	28.4	28.3	10	2 815	2	1.0	4.78
1850	38.65	62 3	18.1	44 2	7	2.955	1	Inapp	5 27
1851	32.72	50.1	16.5	33.6	5	3.885	6	6.7	4.70
1852	35.80	50.4	18.7	31.7	7	1.775	3	2 0	6.50
M'n	36.34	54.65	14.92	39.74	8.5	3.105	4 5	2.6	5.14

Royal Geographical Society.

At the last meeting of the Royal Geographical Society, Captain Petermann read a paper on "Sir John Franklin, the navigableness of the Spitzbergen Sea, and the Whale Fisheries in the Arctic Regions."

The author first referred to his plan of search, which he was induced to submit again to the notice of the public for the following reasons:—First. The assumption on which that plan was based, namely, that Sir John Franklin had passed up Wellington Channel, had been strongly confirmed. Secondly. That it would take Sir E. Belcher two or three years at least to follow Sir John Franklin in his track, which had taken him six years without being able to extricate himself, and return to his country. Thirdly. That the whole of the Asiatic portion of the Arctic regions—in which the missing expedition most probably had been arrested—was at present altogether unprovided for in the search; that that portion was the nearest and most accessible to Europe, and that to it his proposed route was directed; that route went through the sea between Spitzbergen and Novaya Zembya, the subject of his present communication. As the sea under consideration had no name, and as the denomination of "Spitzbergen Sea" was superfluous in its present use, being only applied occasionally to the sea more generally called "Greenland Sea," he proposed, in his remarks, to apply that name for the sea in question. That sea had been navigated by the Dutch, Russian, and other nations, besides the English; but the author wished to impress upon the minds of his hearers, that the facts he was going to draw their attention to were exclusively derived from English authors of the highest authority, and still living. That sea was now-a-days considered by every one as altogether impenetrable and impracticable; but he would show that that assumption was entirely groundless, and rested upon the imagination, forming one of those curious geographical prejudices which, when once they took hold of the public mind, were difficult to eradicate. Eirst, then, on the *prima facie* evidence, he considered the Spitzbergen sea to be the most practicable and easiest of all openings for vessels into the Polar regions, because it was by far the widest, indeed the only oceanic opening. He then stated that Capt. Scoresby's able work on the Arctic regions did not contain a title of evidence to justify the assumption of its being impracticable. On the contrary, it was distinctly stated in that work, that an important whale fishery had been carried on at the eastern side of Spitzbergen, in the beginning of the eighteenth century. Captain Beechey's work, the most important one on that region, contained still more definite information to support his views; and from a communication of Mr. Crowe, British Consul at Hammerfest, an establisher and proprietor of a British settlement at Spitzbergen, the following passage was quoted:—"Mr. Shordslin, an intelligent Russian, with whom I have frequently conversed, actually passed 39 winters on Spitzbergen, and resided there for fifteen years without having once left the island. He declares, that during his residence he invariably found the coasts free from ice for four and sometimes for five months in every year. I am enabled to add that my own vessels have frequently navigated the coasts from Ryke Yse's Islands, the south-east extremity, round the west coast, to the Seven Islands, at the northern extremity, and that four times out of six they might have circumnavigated Spitzbergen." The author then compared Spitzbergen, reaching beyond the latitude of 80 deg., with the regions on the American side in lat. 75 deg., and stated that Sir E. Harry, in little boats, had attained the latitude of 83 deg., to the north of Spitzbergen, in a voyage which only took six months from the river Thames and back, and only cost £9,977; whereas on the American side, where all the recent expeditions had been accumulated, it had cost many hundred thousand pounds, many lives, many years and vessels to attain the latitude of only 76 deg. The voyage of Captain Wood, in 1676, the last attempt to effect the north-eastern passage, was then passed in careful review, and it was proved that that unfortunate navigator, from being disappointed in not being able to effect the passage, had given out many false and groundless statements, in order to show the impossibility of navigation in those seas, and, as Captain Beachy stated, "he seems to have been determined to create an imaginary barrier which should deter any other persons from renewing the attempt." Those false and absurd statements, the author said, seemed ever since 1676 to have influenced the minds of the public, and created the aforesaid prejudice. The author then stated that a voyage with a steamer could settle the question at issue in a fortnight, and a most trifling cost compared with the millions which had been spent in Arctic and Antarctic discoveries; and he said that, irrespectively of the Franklin search, the exploration of that large and very accessible sea, would most probably lead to results of the highest importance to the British whale fishery. The Greenland sea had been "fished out;" but in the Spitzbergen sea the whales had never been disturbed; and he adduced certain facts to show that the number of whales in that direction must be prodigious. He then alluded to the Americans, who had fished up in the Behring Straits whale-fishery the value of $8,000,000 in the short space of two years, and hoped the English would not allow themselves to be anticipated in like manner in the Spitzbergen sea. And as to geographical discovery, it was evident that when Sir E. Perry had been able to reach the latitude of 83 deg. in little boats, with the assistance of steam, results might be attained which would eclipse in interest all other Arctic discoveries yet made. This paper excited a great deal of interest, and a lively and prolonged discussion upon it followed, chiefly between the author and Captain Beechy, R. N. This gentlemen said that the Spitzbergen sea had been frequently tried without success; that Sir E. Perry had found much ice; and that, if any expedition was to be sent up that way, it should go on the western side of Spitzbergen, and not on the eastern side, as Mr. Petermann proposed. To these objections Mr. Petermann replied that since 1676 no attempt whatever had been made to proceed to the east of Spitzbergen; and that even of the slight attempts previous to that date, that of Barentz—the very first—had been exceedingly successful. Those early voyages altogether could form no just criterion for the present day. Admiral Lutke, who had been employed for four successive years in surveying Novaya Zembya, had distinctly stated that a vessel, as fitted out by the English in their Arctic expeditions, would be able to navigate those seas. As to Sir E. Perry, that gentlemen himself, at the conclusion of his work, had emphatically stated, "that a ship might have sailed to the latitude of 82 deg. almost without touching a piece of ice." At all events, he hoped that the geographers and navigators, as well as the authorities of this country, would agree with him in considering it desirable and important that the great Spitzbergen sea should be thoroughly explored, for the cause of humanity, as well as for commerce and geographical science.

The Electric Light.—Mr. Thomas Allan, of Edinburgh, who has successfully introduced several valuable modifications in the construction of the electric telegraph and its working details, has just suggested a novel arrangement for keeping up a constant and equal distance between the carbon points in the production of the electric light. The two electrodes are formed spirally, or on the principle of the screw, and each bearing its carbon point, they are placed perpendicularly to each other at a proper distance, and made to revolve slowly by a simple clock-work movement. As the distance by the action of the current is gradually being increased, the points are always gaining their proper position by the rotation of the electrodes presenting fresh points of action. The proper distance between the points, is therefore constantly kept up, and a steady, as well as a brilliant light is the result. The plan is said to promise to be highly effective for lighthouse purposes.

New Alcohol—M. Wurtz, Professor at the Ecole de Médicine, has succeeded in extracting from the oil of potatoes a new alcohol, which he calls "Alcoöl entylique." It is obtained by repeated distillations. Its composition is $C_8 H_{10} O_2$.

MISCELLANEOUS INTELLIGENCE.

DOMESTIC.

Toronto Northern Railroad: Election of Directors.

On Saturday, December 10th, the election of Directors of the Ontario, Simcoe and Huron Railroad Union Company, took place at the office of the Company, on Wellington Street, in conformity with the provision of the amended Act of Incorporation. The President of the Company, Charles Berczy, Esq., presided, and explained the object of the meeting, when some desultory conversation arose, and explanations, in answer to questions, were made by Mr. Morrison, the Vice-President, and other members of the Board. Mr. Sladden officiated in his place as Secretary, and Messrs. Arnold and Miller were appointed Scrutineers. The voting was continued until four o'clock, P. M., when the Secretary and Scrutineers commenced to sum up the votes, which was an operation that occupied several hours. The return of the following names of gentlemen duly elected, to form the new Board of the Company, was formally made at eight o'clock, P. M. We put the names in the order of the votes, with the numbers opposite to each:—

B. W. Smith	5,852
Isaac Gilmor	5,747
C. J. Orton	5,729
J. C. Morrison, M. P. P.	5,699
Hugh Scobie	4,908
James Mitchell	4,891
Duncan Macdonnell	4,570
G. H. Cheney	4,298
E. C. Hancock	4,255
Angus Morrison	4,238
W. A. Baldwin	4,192

The above named gentlemen are, therefore, the members of the Board of Directors of the Ontario, Simcoe and Huron Railway Union Company.

At the first meeting of the newly elected Directors, held at the Board Room on Tuesday, December 13th, Joseph C. Morrison, Esq., was

appointed President of the Company, and Hugh Scobie, Esquire, Vice President. The position of the Company is very satisfactory; and it appeared from the proceedings that the operations are such as to ensure an *early* opening of the road over a portion of the line, as far as Lake Simcoe; and the full extension of it, for traffic to Lake Huron, soon thereafter. The meeting was satisfied with these favourable prospects; and we congratulate the Company on its truly prosperous condition, which must be very gratifying to all concerned, in the success of the undertaking. The beneficial influences of the work are already felt in the country through which the line passes; and will be infinitely more so when the "Iron Horse" commences to make its regular run, day by day, between broad Ontario and Huron. There is but a very short time to elapse until this great benefit to the inhabitants of the intermediate places, and both extremities, is realized.—*Colonist.*

Canadian Canals.

The total movement on the canals for 1851, and three years previous, is as follows:—

	1848.	1849.	1850.	1851.
WELLAND CANAL.				
Tons	307,611	351,596	399,600	691,627
Passengers	2,487	1,640	1,930	4,758
Tonnage of Vessels	372,854	468,410	588,100	772,623
ST. LAWRENCE CANAL.				
Tons	164,627	213,153	288,103	450,400
Passengers	2,071	26,997	35,932	33,407
Tonnage of Vessels	5,648	5,448	6,169	6,934
CHAMBLY CANAL.				
Tons	17,835	77,216	109,040	120,720
Passengers	470	8,430	278	1,860
Tonnage of Vessels	659	1,264	2,878	1,727

The receipts of 1851 were	£76,216
Expenses	12,285
Of the gross tolls, the Welland produced	48,241
The St. Lawrence	21,276

Agricultural Products of the United States, for the year 1850:

Wheat	bushels	100,493,874
Indian Corn	do.	592,286,224
Tobacco	pounds	199,752,646
Cotton	bales	2,468,625
Wool	pounds	52,529,450
Wine	gallons	221,219
Butter	pounds	312,990,730
Hay	tons	12,739,323
Maple Sugar	pounds	33,880,617

FOREIGN.

Death of the Countess of Lovelace.

The Countess of Lovelace, the sole daughter of Lord Byron, died on Saturday, (Dec. 4.) Such is the brief announcement of the death of a lady whose rare endowments were worthy of her illustrious parentage, and who appears to have inherited, with much of the genius, much also of the moral daring which combined with it, to make him, as he proudly asserted, "not altogether of such clay" as that race of fellow men for whom he professed such unhappy contempt. Lady Lovelace, beside being one of the many to whom the authorship of that 'rock of offence' the Vestiges of Creation has been at one time attributed, a proof at least that her attainments in the subjects it treats of were of a high order, was the avowed author of works, of a character seldom to be found proceeding from a female pen, and particularly of a masterly translation of Chevalier Menabrea's 'Memoir of the Analytical Engine invented by Charles Babbage, Esq., (*Scientific Memoirs, vol. III.*) which she accompanied by elaborate and learned notes, considerably longer than the memoir itself, involving not only the applications of very high mathematics, but a thorough mastery in principle of one of the most difficult and complicated inventions of the human mind. This engine must not be confused by our readers with what is commonly called Babbage's calculating machine, it is one of a much higher order. The latter, or difference engine, in the words of the gifted lady we have now to deplore, could only tabulate *accurately* and to an *unlimited extent* all series whose general term is comprised in the formula,

$$u_z = a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6$$

and was chiefly designed for the calculation of nautical and astronomical tables; the former, or Analytical Engine, would be capable, if completed, of developing and tabulating any fraction whatever, being, so to speak, the embodyment of the *science of operations.* "Those," she writes "who view mathematical science not merely as a vast body of abstract and immutable truths, whose intrinsic beauty, symmetry and logical completeness, when regarded in their connection together as a whole, entitle them to a prominent place in the interest of all profound and logical minds, but as possessing a yet deeper interest for the human race, when it is remembered that this science constitutes the language through which alone we can adequately express the great facts of the natural world, and those increasing changes of mutual relationship which, visibly or invisibly, consciously or unconsciously to our immediate physical perceptions, are interminably going on in the agencies of the creation we live amidst; those who think on mathematical truth as the instrument through which the weak mind of man can most effectually read his Creator's works, will regard with especial interest all that can tend to facilitate the translation of its principles into explicit practical forms." In this high spirit did the translator undertake her laborious task. That talents so great and masculine, in union with purposes so noble, should sometimes come out of the retirement, often ignorantly associated, by the detractors of hereditary nobility, with no other idea than that of frivolous amusement or vapid idleness, is a thing we rejoice too much to see, to lose this occasion of paying it a passing tribute.

The Iron Trade.

The recent rise in the price of iron, and the discussion which it has caused respecting the stock of Scotch pig-iron have induced us to make some particular inquiries into the state of this trade, of which we subjoin the results. At the commencement of the present year 114 furnaces were in blast in Scotland. The price of G M Brands M No was 38s. per ton; but the market became more depressed and prices receded to 35s. 6d. in February; for prompt cash in exchange for store warrants f. o. b. in Glasgow. A few furnaces were soon after blown out; but large purchases having been made on speculation, at 36s. to 37s. per ton, and some English consumers having entered on large contracts, confidence was restored in the article, and with that came a demand for increased wages from the miners and iron workers, followed by improved sales of malleable iron, which, altogether, tended to advance the price of pig-iron, and secure the average quotations of subsequent months, which we subjoin. A large speculative business has been done for some time past, but upon a stronger basis than the speculations of 1845 and 1850. We are aware that at the periods in question numerous transactions occurred in pig-iron, which was not made, and was represented by the makers' engagement to deliver on demand. The present purchases are made on store-keeper's warrants, and we know that the article paid for is in existence. Since the month of February to the present time the receipts in the store-keepers' yards here have not been less than 1,000 tons daily. The production in Scotland is greatly disputed by different parties; because on that depends the question whether stocks are accumulating. Changes have been made in the construction of furnaces, and in the process of smelting during recent years, which, although not universally adopted at once in all the works, have gradually increased the aggregate make from the same number of furnaces; and the average per furnace may now be assumed at 135 to 140 tons per week. One high authority on these matters states the differences in production at from 100 tons to 180, and even 200 tons weekly per furnace. We do not think that 200 tons have been reached in many instances, or even 180; but still we think that 135 tons are probably the average production. The Scotch consumption was calculated in 1851 at 250,000 tons in all descriptions of works. The malleable works have increased their products, and the number of foundries has also increased; but, we believe, that since the recent rise in iron, as foundry goods have not gone up in an equal proportion, the supply for them has rather been contracted. The Scotch consumption during the first ten months of the present year has been estimated at 220,000 tons. A decrease of shipments during the same period of 23,000 tons has also occurred. In November the latter trade has obviously and rapidly revived; while a larger than the usual quantity now waits freight. If the present prices be permanent the production will be increased; but that cannot be done rapidly, for a number of furnaces are always out of blast. An increase of the Ayrshire furnaces is expected, but not during the currency of the present year.

The number of furnaces built at the 1st January last was 143, and building 1	144
Of which, at that date, were in blast	114
Ditto at 1st July last	104
Ditto now	112

The annual production of 112 furnaces at an average of 130 tons

per week each, is annually 757,120 tons, and deducting 250,000 tons for local consumption, leaves over half a million for export, but with existing means that quantity could be greatly increased, and the yield gives an aggregate annually of probably 60 000 tons over this statement. The difference between February and present prices if the latter can be maintained is, therefore, equal to £800,000 annually to the meders.—*Expositor.*

New Thermometer for Maximum Temperatures.—Some three centuries have now passed since the invention of the thermometer by Sartorius and Drebell, in which but little improvement has been made on the original. Since the introduction of the registering thermometer no advance has been, and the steel index has been depended upon, although always liable to great incorrectness, either from becoming fixed in the tube, and the mercury passing it; or from its falling back with the mercury, and not registering at all. In the thermometer just introduced Messrs. Negretti have no needle, the mercury registering correctly itself. About an inch above the bulb a small cylinder of glass is forced into the tube, which is then bent at right angles, the graduated portion lying horizontally. With an increase of temperature, the mercury finds its way through the capillary pores left between the cylinder and the circumference of the orifice; but on a decrease, the mercury left horizontally in the tube cannot get back to the bulb, and remains at the index of the highest point of temperature it had reached since it had been previously set. In the construction of the instrument much delicacy is required; it being so arranged that the mercury, from the effects of heat, passes the glass valve, but on cooling cannot return, the resistance offered being greater than the attraction of cohesion between the particles of mercury above the bend and those below it. This instrument is most admirably adapted for ascertaining the temperature of shafts and levels in deep mines, the sea at various depths, and other like purposes. To ascertain the temperature at any moment, it is only necessary to place it vertically; the mercury instantly subsides, and a few seconds will show the precise heat of the atmosphere. This instrument has given the most complete satisfaction to the Astronomer Royal, and many other philosophical and scientific individuals and bodies, and the Council of the Meteorological Society stated that "this thermometer is the best which has yet been constructed for maximum temperatures, and particularly for sun observations; for as the reading is determined by the entire mercurial column being detained at its highest point by simple contrivance within the tube, the necessity for an index is avoided, and with it the constant and distressing recurrence of derangement attendant upon the employment of those generally in use." Almost the first important improvement made in the thermometer—that of enamelling the back of the tube, was introduced by Messrs. Negretti, but for which, as is too commonly the case, we believe they have not had that justice awarded which the idea deserved. We are led to make these observations, knowing the difficulty frequently experienced by inventors in the introduction of a new instrument, however important, when it is their wish to retain the credit of their own discovery; many objects present themselves—as the jealousy of the trade, settled prejudice against what is termed "innovation," and private interest—so that in but few instances the desired end is attained. The Exhibition Jury, in this particular class, evidently took much care in discriminating the works of different exhibitors; for here we have a firm comparatively unknown to the scientific world, proclaimed, to the surprise of many, as manufacturing instruments of this description superior to any in the Exhibition of all Nations [vide Report, page 654]—an assertion which we see fully borne out, by their now having perfected an instrument which had long been attempted in vain, most completely supplying a scientific requirement long severely felt.—*Mining Journal.*

Electric Telegraphs in India.—It has been announced that the East India Company have determined to establish immediately a very extensive system of electric telegraphs in India, under the superintendence of Dr. W. B. O'Shaughnessy, of their medical establishment. It is intended to connect Calcutta, Agra, Lahore, Bombay, and Madras, and as many of the principal towns and stations as can be embraced in the routes between these places. The distance to be traversed is upwards of 3000 miles, and it is intended to proceed with such expedition in its construction that its completion may be expected in three years from the present time. Dr. O'Shaughnessy has lately been employed in India in carrying on experiments with the electric telegraph, in order to discover the best system which could be adopted.

Charity.—Modern London contains, for its nearly three millions of inhabitants, thirteen general hospitals, all of them well appointed with every appliance for the relief of suffering humanity. In this list we include St. Bartholomew's, St. Thomas's, Guy's, the Westminster, St. George's, the London, the Middlesex, University College, Charing-cross, King's College, the Royal Free, and St. Mary's. The thirteen hospitals contain a collective staff of from 140 to 150 physicians and surgeons, all of whom we must suppose to be fitted for the highest duties of the profession. Besides the accredited medical staff of each hospital, at least an equal number of qualified medical practitioners are attached to them as resident medical officers, pathologists, registrars, and assistants of various kinds. The poor persons and others—for all hospital patients are not poor—seeking relief from our hospital system, amount to no less than the astounding number of 300,000 annually. We have extracted this amount, without any wish to exaggerate, from the best returns, as furnished by the hospitals themselves. The figures will be accredited when we state that the largest of our nosocomial establishments, the Royal Hospital of St. Bartholomew, succours nearly 5,500 in-patients annually; and that its in and out patients nearly reach 80,000 in the year. Yet this vast system of relief, and the immense amount of medical and surgical skill consumed in its bestowal, are nearly—we had almost said, entirely—gratuitous. Was ever such a spectacle of gratuitous toil exhibited as that which is involved in these figures?

Turkey in Europe.—The projected English railroad through the northern Turkish European provinces excites much attention there, and is pronounced by the *Wanderer* to be a matter even more important than the Egyptian Railway. It appears that six English engineers have already been examining the country between Constantinople and Belgrade; and in a letter from the latter city to Agram, a hope is expressed that the Servian government will also construct a line from Alexinac (probably Alexinitza, near Nissa, on the western frontier of Bulgaria) to Belgrade.

Transmission of Motive Power.—M. Fontaine-Moreau, of South-street, Finsbury, has patented a plan for the transmission of power in lieu of cog-wheels and pinions, straps and bands. This is effected by means of an angularly grooved wheel, with another working therein of a wedge form, and by the grip to be obtained any description of machinery may be set in motion.

Railway Traffic in Great Britain.—The general results of traffic over all the railways in the united kingdom show that the aggregate number of passengers conveyed in 1850 amounted to 72,854,422; in 1851, to 85,391,095; being an increase of 14,536,673, or 17½ per cent. The gross receipts from passengers in 1850 amounted to £6,827,761; in 1851 to £7,940,764, showing an increase of £1,113,003, or 16·3 per cent. The gross sum received for the transport of goods amounted, in 1850, to £6,376,907, and in 1851, to £7,056,695, showing an increase of £679,788, or 10·6 per cent. The gross revenue of all the railways, arising from traffic of all descriptions, which in 1850 amounted to £13,204,668, amounted, in 1851, to £14,997,459, or very nearly £15,000,000, showing an increase of £1,792,791, or 135 per cent.

The Debt of the United States.—According to a calculation by the New York *Times*, the total amount of the debt of that country amounts to 270,000,000 dollars. The minimum estimate of that portion of the above owned or advanced on, abroad, is as follows:—Federal loans, $40,000,000; State loans, $143,000,000; county loans and bonds, $24,000,000; country loans and bonds, $2,000,000; railroad bonds, $20,000,000: total, $225,000,000.

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription,) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute. First—Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. Second—Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the improvement in Art and the rapid progress of Science in all countries,—a marked feature of the present generation. Third—Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable and, to say the least, a patriotic undertaking,—a wish to encourage a Society where men of all shades of religion or politics may meet on the same friendly grounds: nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, JANUARY, 1853.

CONTENTS:

PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

Plan of the Harbour of Louisburg, Island of Cape Breton. 45°54′ N.L. 59°58′ W.L.

S. J. Stratford

The Canadian Journal.

TORONTO, JANUARY, 1853.

CANADIAN INSTITUTE ESTABLISHED 1849

INCORPORATED BY ROYAL CHARTER.

The Annual Address of the President of the Canadian Institute was delivered on Saturday, January 8th, at the Rooms of the Institute, in the old Government House. The number of members present exceeded forty. The presence of the Hon. The Chief Justice Robinson and many other distinguished and earnest well-wishers of literary and scientific progress in the Canadas, afforded a very gratifying indication of co-operation and interest in the proceedings of the Institute.

The preliminary business of the evening consisted of the revision and amendment of the Regulations and By-laws of the Institute, the election of members, &c.

The following gentlemen were elected members of the Institute:

The Reverend W. A. Adamson, D. D., Librarian Legislative Council .... Quebec.
Charles Rahn .... Toronto.
W. J. Fitzgerald .... Toronto.
Samuel Spreul .... Toronto.

The members proposed were,—

Major Lachlan .... Montreal.
Dr. Connor .... Toronto.
William Hawkins .... Toronto.
Thomas Henning .... Toronto.

The President announced the establishment of Two Prize Medals by the Council for the best Essays on the following subjects:—

1.—A Medal, value £10, for the best comprehensive essay on the Public Works of Canada, their commercial value, their relations to a general system of American Public Works, their engineering peculiarities, cost and other statistics, to be accompanied by illustrations.

2.—A Medal, value £10, for the best essay on the physical formation, climate, soil and natural productions of Canada.

Notice was given by the President that a paper on "The Mineral Springs of Canada" would be read before the Institute by Professor Croft, at their next meeting, on Saturday, January 15th.

The President's Annual Address.

The termination of the official year, gentlemen, or the commencement of a new session, is the time when it seems fitting for the President of our Society to exercise the privilege of addressing to it that commentary on its affairs,—and its actual position,—or it may be that counsel and suggestion,—which cannot be well incorporated in a Report. I think there can be no difference of opinion as to the advantage of this course, where there is any real activity in the body to respond to it, or the essential part which an annual Address may perform in sustaining the action of the Society, coming from an officer whose voice will, in general, have a weight precisely proportioned to that earnestness, activity, and ability, of which the Society is itself the exponent. On this account I have not shrunk from the responsibility of establishing the proper precedent, by venturing to address you now, notwithstanding the circumstance that less than twelve months ago you were pleased to accept me as the President's representative upon a similar occasion. Nor will I pay the Society the questionable compliment of too strongly expressing—what it would, however, be impossible for me not to feel—a sense of unfitness for the office to which you have been pleased to call me; and which, if it implied anything more than an acknowledgement—very gratifying to myself—of previous services, and of, perhaps, some advantages, from accidental circumstances, for aiding the endeavours of the Society, I should have been most reluctant to assume. I will merely beg, therefore, that you will on this occasion divest my views or advice from any other claim to authority than they may possibly derive from the manner in which they commend themselves to your own judgment.

It is not organization, gentlemen, which makes the difference between things animate and inanimate, but Life. "Stone walls, do not a prison make;" nor do apartments and paraphernalia make the learned society,—but Learning. It is not enough for us to have combined ourselves to effect certain useful objects, if having done so, we individually leave those objects to take care of themselves. I venture to press this very obvious truth; because upon the spirit of our first complete session may probably depend much of the support which we may fairly claim from the community, and the interest which enlightened and liberal men may take in our proceedings. In our actual circumstances, we cannot altogether trust, as larger and longer established societies may do, to spontaneous efforts, but must strive to give reality to what in their cases becomes but nominal,—a claim of the society upon the active exertion of each individual member. There is an MS. preserved in the British Museum which gives a list of the members of the Royal Society at a very early date; and a sort of memorandum against the name of each, as to what might be expected of him. There are some, —and I am sorry to say Newton is one of them,—with the words "no pay" against their names. Sometimes, however, with

the addition, "will contribute experiments;" there were others who were expected not only to pay, but to "give yearly one entertainment to the Society." Now, I think, it may be said that that we do not indulge these brilliant prospects of entertainments, and do expect all our members to "pay;" but still more confidently may we expect that lively general interest on their parts which will impel all from whom it may be reasonably looked, to "contribute experiments;" that is, to prepare papers upon the subjects of their several pursuits or studies, and induce those who have joined us principally with the kind and generous purpose of assisting objects which they respect, but do not pursue, to give one additional proof of their interest, by occasionally attending our weekly meetings.

It is, perhaps, too much to expect that there can be, at present, any considerable proportion of papers upon scientific subjects elicited from the Society. Not to dwell upon the fact that the production of such papers presupposes the existence of acquirements and of pursuits which we know to be the characteristics of a different state and stage of society from that existing in Upper Canada at present, and which it is our hope and aim to develope, rather than our pretension to embody, we labour under several special disadvantages. For instance, the simplicity and sameness, over great areas, of the geological formations of this peninsula,—their comparative poverty in fossils,—the absence of mountain ranges,—the limited catalogue of its mineral productions; all undoubtedly combine to deprive that delightful study of many of its attractions, and to deprive societies like ours of an allurement and stimulus to individual exertions. The same physical peculiarity limits to a certain extent, I presume, as compared with other geographical provinces of this continent,—the field of the naturalist and botanist, at least in some departments; for entomology and probably ornithology are exceptions. But we should be very wrong to infer from this that there is nothing for the cultivators even of those branches of science to learn, nothing which they may contribute to the knowledge of the world. It was a keen eye in Mr. Hunt which detected in the coarse-grained silicious sandstones of the River Ouelle, belonging to the Lower Silurian formation,—those few, scattered, anomalous foreign substances,—the longest fragment about an inch and a half long and one-fourth of an inch in diameter, whose chemical constitution, revealed by his skilful analysis, sustains a supposition which even geology, habituated as it is to have its landmarks carried ever further and further back into the bosom of the eternity behind us, deems almost too extravagant for belief. These bodies consist in great part of phosphate of lime; and every thing about them, save only their startling antiquity, leads him to the belief,—shared also, there is reason to think, by geologists of great eminence,—that they are the bones of vertebrate animals, and that certain nodules of similar constitution accompanying them, are coprolites: thus actually revealing not only the existence but the carniverous character of races of the animal kingdom which have been heretofore supposed to have had no existence on our globe until a much later period. I do not, however, allude to this discovery—on which Mr. Hunt observes becoming caution, and which the distinguished director of the geological survey has not, that I am aware of, supported as yet with his own authority,—as if it were established; but refer to it simply as a recent illustration, furnished by a Canadian geologist, of what close observation, prompted by a spirit of enquiry, and sustained by sound knowledge, may detect in an apparently unpromising field. Mr. Abraham's interesting discovery of crustacean footprints in the argillaceous schist of Beauport is another case in point. We might come much nearer home. How many of us have made our daily walks in this busy neighbourhood subservient to the same study? Study Palæontology, collect fossils at Toronto! I can imagine some one to say, as if the idea were preposterous; yet one of our members, Professor Hind, has found a large proportion of those of the Hudson River group, figured in that magnificent work, the Palæontology of New York,—I believe some fifty or sixty at least, and some which are apparently undescribed there,—no further from hence than the banks of the Humber bay. At the late Provincial Fair, held in this city, was there not one thing exhibited, where we should have least expected to meet with it, which suggested to every one who saw it the happiness of a love for natural history, and the astonishing richness of the humblest section of that wide field? I allude to the curious collection of objects illustrating insect architecture, gathered by Mr. Couper, of this city, which accompanied his entomological collection. And it needed but close observation and a love of nature to find the works of instinct, varied to meet a thousand needs, in which the humble yet Divine intelligence of the Architect lived before us, where most of us, perhaps, have found only the pests of our gardens. I know that a military officer, recently in this garrison, who combined the naturalist with the sportsman. formed an extensive ornithological collection, while actually performing his duties here; and most of us have contemplated with interest and instruction the collection of birds, shot I believe entirely in this neighbourhood, which Mr. Doel has exhibited on various occasions. It cannot be said that there is not ample scope for pursuits of natural history even in this neighbourhood. It may require an Agassiz to detect in the *Lepidosteus* or gar-pike of our lakes, that remote reptilian character which distinguishes it from every known fish, and stamps it as the last and only representative of the gigantic race of fish-lizards of the secondary epoch; but we need not such confirmation of the truth which probably no one will question, that our streams, our lakes, our woods, our fields,—all, beyond a doubt,—present, in their inhabitants or their productions, a full proportion of those nice and narrow distinctions from similar objects elsewhere, which form the peculiar study of the naturalist, and are so often connected with the broadest and most important enquiries raised in the progress of science.

In venturing, then, to guard against exaggerated views of what such a society as ours can effect, by remarking that we must not expect that papers on purely scientific subjects can be frequently presented to us, at present, I had in view, chiefly, the circumstance that our constitution is avowedly practical, and, in some measure, even professional; for it was the Professional Society of Engineers and Architects from which it derives its origin; and any one who has remarked the curious descent, as some might call it, ascent

I would rather say, which the successive societies established in Toronto have made, from objects chiefly fanciful to objects essentially real, who traces the principle of association through the original Shakespear Society, the Literary and Historical Society, the Athenæum, to the Canadian Institute, will doubt that in this practical element lies our best hope of a more permanent and active existence than rewarded the establishment of the societies which have preceded us.

It has been boldly said by Tennyson, that

> We are the ancients of the earth,
> And in the morning of the times.

Assuredly these words are no where more true than here. All which time alone can bring to maturity may be wanting around us, but ought we not to find in its place the buoyancy, the life, and the aspirations of youth? Measured on the gigantic scale of centuries of science, our results may, perhaps, for a time appear diminutive enough; let them not fail, however, to receive at least from ourselves, something of that grateful acknowledgement which made heroes, and sages, and demi-gods, in times of old, of the authors of sufficiently simple discoveries. It will be well, however, if the same state of things do not betray us into a danger not unknown to similar associations: that of substituting reciprocal compliment for a well-founded estimate of our real status, and indolently lowering the standard by which the world will judge us, to that scale upon which it may be most agreeable to judge ourselves. One of the most distinguished of the men of true science in the neighbouring States has recently drawn a lively picture,—for the truth of which, however, he appealed to all his hearers,—of the degree to which, in the generation immediately succeeding the War of Independence, a species of charlatanism, deriving its countenance and support from the general ignorance of the community, intruded into the place of science, and outvoted it in every division of forces. "Our real danger," said he, in words applicable to every country in which an elevated standard of acquirement is wanting, "lies now from a modified charlatanism, which makes merit in one subject an excuse for asking authority in others, or in all; and because it has made real progress in one branch of science, claims to be an arbiter in others. Sometimes this authority is thrust on men who, not having the force to enlighten those who press them as to their real claims, injure the cause which they would fain promote, by being too impressible. Merit thus moulded assumes the form of the impressing body. Whether the authority be seized or accepted it is unlawful." Thorough knowledge of subjects of science other than those by which, in a young country, men may earn their bread, is not ordinarily reconcileable with that indispensable prerequisite; but happily it is pretence, not ignorance, makes the charlatan. Avoiding exaggeration of language, and sustaining always, by the aid of a well-selected library, and ready access to contemporary scientific literature, a just and temperate view of the value, as regards the world, of those efforts which to ourselves alone are of high importance, we cannot fail to pass safely over that epoch of danger, which, in the case referred to, preceded the maturity of the national growth. I see no reason why, in a few years, a Canadian society should not rank with those of highest character on this continent. Already have our great public works created a demand for the highest science of the engineer. Railroads, with their long train of applied arts and sciences; processes of manufacture, which science first divulged, and science alone can direct, are obeying the attraction of profit, and naturalizing themselves on this new soil. With these practical sources of support, and with five or six universities or colleges, including a very numerous professorial body, and one which counts among its members many names of distinguished academical rank, it is surely something beyond a provincial standing to which a society in Upper Canada may ultimately aspire. But, gratifying as we must feel the support given to us to be, we cannot say that this Institute as yet by any means unites the strength of these bodies; some of them, I believe, are not represented among us at all, and it must be a work of time to gain the confidence and interest of all. Among the endless examples furnished by the life of that illustrious man,—of whom it has been so truly said that he left no duty incomplete, as he left no honour unacquired,—there is one so appropriate to our present subject that I may be pardoned for alluding to it. Late in life did the great Duke of Wellington remember that he had still to testify his respect for those other fields of human rivalry and labour, in which the elder Herschell, Davy, Wollaston, Young,—while he was waging the battles of liberty,—were winning equally imperishable fame, and adding other conquests to the dominion, not of their country, but of their race. In his seventy-eighth year he became a Fellow of the Royal Society. A similar view of duty taken by all those to whom it equally applies would add not a little to our strength and our resources. A command of funds is much more essential to a society like the Canadian Institute than may at first sight appear. The liberal assistance granted to us by the government, to be amply justified, I trust, by our use of it, has for the present relieved us from embarrassment; but with our present very low rate of annual subscription, a considerable portion of which also returns to the member in the form of a monthly publication, a numerous list of members is almost indispensable. It has been already stated by the Council in the annual report, that we do not aim at present at forming a general library or a general museum; but we desire that at the earliest possible period, students in any ordinary subject of science, shall find here the most recent standard works on that subject, and collections illustrating it. Of the former, a selection has already been ordered; our progress with the latter rests very much with ourselves. It is much to be wished that members should bear in mind the great acceptability at the outset of almost any thing belonging to the departments of geology and natural history, and make such individual contributions as may be in their power. By separate exertions, in different quarters,—the quadrupeds and the birds,—the fishes, the insects,—the land and fresh-water shells, as well as the flora of the country, might undoubtedly be pretty completely collected in a year or two, and a great impetus, as well as a great assistance, given to future researches. It is a pleasure here to refer to the success which has attended the exertions of our sister societies at Quebec and Montreal in this respect, as calculated to give us much encouragement.

I have alluded to the Canadian Journal, and trust I may be

pardoned for dwelling a moment upon the claims of that publication to our active and zealous support. The advantages of a ready medium of publication, its tendency to encourage the preparation of papers; to elicit, and to attract as it were to itself, by degrees, the information and knowledge which is afloat in the community, are so great that it may seem superfluous to insist upon them, but it may be scarcely less valuable, I conceive, as an index of the life that is in us; a criterion of the actual state of scientific knowledge in Upper Canada, and a permanent evidence of the widening basis, the expansive growth of those pursuits, which it is the object of this Institute to combine and strengthen. Let us hope, that while in the practical departments of the mechanic, the engineer and the architect, it witnesses the treatment of greater, more important, and more various subjects every year, as the industrial progress of the country will cause it to do; so also there may appear the necessity for such an improvement in the standard of the original and selected articles on scientific subjects, as may shew increasing strength, and a higher faculty, in that class of readers. It is greatly desirable at present that our individual endeavours be given to extend its circulation, and to put it upon a footing to yield some just remuneration for the editorial labour at present bestowed gratuitously upon it.

It is with great pleasure, Gentlemen, that I am permitted to announce that the Council has decided to offer two medals for competition in the session of 1853-4.

One medal of the value of £10, for the best comprehensive essay or paper on the Public Works of Canada, their commercial value and relations to a general system of American Public Works; their characteristics in an engineering point of view, cost and other particulars, to be illustrated by all necessary maps, plans, or drawings.

And, one medal of the value of £10, for the best essay or paper upon the physical formation, climate, soil, and natural productions of Upper Canada, to be also illustrated by all necessary maps or diagrams.

The amalgamation of the Toronto Athenæum with this Society, a subject referred to in the Annual Report of the Council, promises, I am most gratified to be enabled to state, to be speedily carried into effect. It will give us the advantage of the Library, which that institution owes in great measure to the persevering and indefatigable exertions of its most efficient Secretary, Mr. S. Thompson, and remove all appearance of rivalry or division of forces in a cause in which all should combine.

It would be doing an injustice to this Society were I to omit, on this occasion, to mention, on any false grounds of delicacy, a circumstance which cannot be regarded as unimportant, in reference to the progress of the physical sciences in Canada. I allude to the intention, officially expressed by the authorities under whom I have the honour to be employed here, of withdrawing at an early period the military detachment by which a series of observations in Magnetism and Meteorology has been maintained in this neighbourhood, since the year 1840. Naturally deeply interested in the continuance of enquiries which have absorbed the best years of my own life, and in whatever can bring credit to a country to which I am bound by very strong ties, I cannot but hope that means may be devised in the Colony for maintaining a Physical Observatory at Toronto, upon a scale fully adequate to the continued investigation of the numerous and interesting subjects of enquiry, which it has hitherto cultivated; and with such additions as in abler hands may make it an honour to the country. It is not for me, on the point of resuming a purely military position, to concern myself unduly in a civil and colonial question; but, neither, on the other hand, is it for me, in the office to which you have been pleased to call me, to neglect to call your attention to a question in which the public opinion will probably have its due weight, and to which the Canadian Institute, as a body, cannot be indifferent.

I have now, Gentlemen, trespassed sufficiently long upon your patience. This Society has a dignified, an honourable and a patriotic object before it; the field is wide, and ready for the harvest; if the labourers are still few, and if much of that knowledge, contingent upon a thousand advantages never as yet brought within our reach, which alone can truly appreciate or encourage their exertions, is at a low point among us, let us not doubt that it will gain ground with rapidity, and receive new impulses, and new rewards, from every endeavour we make to carry into effect the objects of our incorporation. The talent and the energies which can overcome disadvantages, can unquestionably be looked for as confidently in our body, as in any similar society. I think it might be said, are as unquestionably present—but this will be best shewn by the event. With harmony and mutual respect among ourselves; with a liberal disposition, as a body, to encourage whatever may justly claim our countenance, and as individuals to listen to whatever has a just claim to respectful attention, although, as will often happen, the subject may be of little interest, perhaps scarcely intelligible, to ourselves; we shall see the Canadian Institute more respected, because more useful, every year, and have the reward of witnessing our society, grow with the growth, and strengthen with the strength, of a country whose progress in every element of material prosperity, will bear comparison favourably with that of any other in the world.

On the Rocks of Canada: by W. E. Logan, F.R.S., and G.S., Director of the Geological Survey.

(Communicated to the Geological Section of the British Association, at the Meeting at Ipswich in 1851, and ordered to be printed in full in the Report.)

In the present paper it is my purpose to place before the Association, in as condensed a form as possible, one or two of the main features of the physical structure of Canada, ascertained in the progress of the geological survey now carried on in the country, under my direction, by the authority of the provincial government.

With the exception of the drift, the country is composed of rocks, none of which are newer than the carboniferous epoch. The general geographical distribution of these rocks, as far as ascertained, and as connected with the physical structure of the bordering States of the American Union, on the one hand, and the sister British Provinces on the other, is represented on the map which is displayed to view.

One of the points to which it is my wish to draw attention is the age of the copper-bearing rocks of Lakes Superior and Huron, as determined by the evidences collected on the Canadian survey; and another, the differences that exist in the structural condition of the western and eastern parts of the Province.

The rocks on the north shore of Lake Superior consist of reddish granite and syenite, which in ascending order pass into micaceous and hornblendic gneiss and allied forms. These are succeeded by chloritic and partially talcose slates, which become interstratified with obscure conglomerates, with a slaty base; and upon them rest unconformably bluish slates, with intermingled bands of chert and limestone towards the bottom, and a thick and extensive overflow of greenstone trap at the top. Reposing on these are white sandstones, which pass by an alternation of colours into red sandstones and conglomerates, often with jasper pebbles, and these are repeated after the occurrence of an uncertain amount of reddish limestone of an argillaceous quality. The sandstones and conglomerates become interstratified with amygdaloidal trap layers, and an enormous amount of volcanic overthrow divided into beds crowns the summit. The sandstones are often argillaceous, and display ripple-mark and crack casts on their surfaces, while the concentric curves of flow sometimes characterize those of the trap. Innumerable dykes cut up the sedimentary and volcanic beds; and both the dykes and the overflows are almost universally marked by a transverse columnar structure. The thickness of the whole from the base of the blue slates cannot be less than 12,000 feet; and the whole formation is intersected by copper lodes of different characters in different places, which run in directions both with and transverse to the strike.

On the north shore of Lake Huron the granite is succeeded by a formation consisting of white, often vitreous sandstone or quartz rock of great thickness, sometimes passing into a beautiful jasper conglomerate, and alternating with great beds of slate and bands of conglomerate with a slaty base, both being interstratified with thick masses of greenstone. A persistent band of limestone of about 150 feet in thickness, and interstratified with thin cherty layers, occupies a place in the series, probably somewhere about the middle. The surfaces of the sandstone often exhibit ripple-mark; and the total thickness of all the members of the formation may be about 10,000 feet. Different intrusive rocks intersect those of stratification; and, as related to one another, they display a succession of events in the history of the formation. There is of course a set of dykes,—greenstone, no doubt,—cutting the sedimentary rocks, and giving origin to the greenstone overflows. It is difficult, however, to identify these; but another set of greenstone dykes are seen cutting both the sedimentary and igneous strata; intrusive granite, sometimes occupying considerable areas, thrusts these antecedents aside, sending forth dykes of its own order, intersecting all, and reaching to considerable distances from the nuclei; and then another set of greenstone dykes, and all that previous causes had placed. Evidences of disturbances and dislocations accompany all these successive intrusions,—those connected with the granite being the most violent. But there is, in addition, another set of disturbances of still posterior date, and it is to these that is due the presence of those metalliferous veins which give the country its value as a mineral region.

In respect to the age of the Huron cupriferous formation, the evidence afforded by the facts collected by my friend and associate, Mr. Murray, (published in our Report of Progress for 1847-48,) on the Grand Manitoulin, La Cloche, Snake, Thessalon, Sulphur, and other Islands, points ranging along a line ninety miles out in front of the coast, is clear, satisfactory, and indisputably conclusive. On these Islands, the Potsdam sandstone, the Trenton limestone, the Utica slates, and the Loraine shales,—successive formations in the lowest fossiliferous group of North America, were each, in one place or another, found in exposures denuded of all vegetation, resting in uncomformable repose, in a nearly horizontal position, upon the tilted beds and undulating surface of the quartz rock and its strata: filling up valleys; overtopping mountains; and concealing every vestige of dykes and copper veins; and it would appear that some of these mountains have required the accumulation of the whole thickness of the lowest three and part of the fourth fossiliferous deposit, equal to about 700 feet, to bury their summits.

The chief difference in the copper-bearing rocks of Lakes Huron and Superior seems to be the great amount of amygdaloidal trap present among the latter, and of white quartz sandstone among the former. But on the Canadian side of Lake Superior there are considerable areas without amygdaloid, while white sandstone are present in others, as on the south side of Thunder Bay, though not in the same vast amount or the same state of vitrification as those of Huron. But, notwithstanding these differences, there are strong points of resemblance in the interstratification of igneous rocks, and the general mineralized condition of the whole, as to render their proximate equivalence highly probable; and the conclusive evidence given of the age of the Huron would thus appear to settle that of the Lake Superior rocks in the position given to them by Dr. Houghton, the late State Geologist of Michigan, as beneath the lowest known American fossiliferous deposits; and in this sequence those of Lake Huron, if not those of Superior, would appear to be contemporaneous with the Cambrian series of the British Isles.

The eastern limit of this formation on Lake Huron is in the vicinity of Colling's Inlet, opposite the eastern extremity of the Great Manitoulin Island, whence it gradually recedes inland, taking a north-eastern course; and farther down the St. Lawrence and its lakes the Lower Silurian appear to rest upon gneissoid rocks, without the intervention of the Cambrian.

If a line be drawn on the map in continuation of the Hudson River and Lake Champlain valleys to the vicinity of Portneuf, about thirty miles above Quebec, and thence in a north-eastward direction, it will divide the country into two areas; which, though nearly resembling one another in the general formations of which they are composed, yet present important differences in their structural condition. Each area belongs to a great trough of fossiliferous strata resting in Canada, with the exception of the supporting Cambrian formation of Lakes Huron and Superior, on gneissoid rocks, and containing coal measures in the centre; and the conditions, in which the two areas differ, are the general quiescence and conformable sequence of the formations from the base of the Lower Silurian upwards in the western, and the violent contortions and unconformable relations of those of the eastern. The coal measures of the eastern area are those of Rhode Island, and in a metamorphic state of Massachusetts, and those of Nova Scotia and New Brunswick. None of the productive part of the New Brunswick coal measures reaches Canada; but there comes out from beneath it, on the Canada side of the Bay Chaleur, 3000 feet of carboniferous red sandstones and conglomerates. These are succeeded by 7000 feet of Devonian sandstones, which rest upon 2000 feet of Upper Silurian rocks, consisting of limestones and slates. The base of the Upper Silurian group has been traced a distance of about 700 miles from Gaspè on the Gulf of St. Lawrence, first to Memphramagog Lake in Canada, thence to Halifax on the southern limit of Vermont, and further into Massachusetts, keeping in its outcrop at a variable distance from the coal. In the interval, between the Upper Silurian and the carboniferous formations, there can be little doubt the Devonian sandstones will display a conspicuous figure in the eastern area, as they are known to be still 2500 feet thick in the eastern portion of the western area, in which they do not die away until reaching the banks of the Mississippi. In the eastern area the Lower Silurian strata sweep round the Upper, occupying a zone of between 40 and 50

miles broad; and the lowest rock common to both, connecting the troughs on the anticlinal, in the valley of Lake Champlain, is the Trenton limestone.

On the north-western side of the western area the formations are in a general flat and quiescent condition from Lake Superior to Pennsylvania, and they succeed one another without any observed want of conformity from the base of the Lower Silurian to the summit of the carboniferous. But it has been shown by Professor Rogers, that proceeding from north-west to south-east there occurs in this state a set of successive parallel undulations which increase in intensity in the direction mentioned, and on the south-east side of the Apalachian coal-field are sufficiently violent to produce overturn dips in all the formations together, the coal inclusive. These plications with their overturn dips thus form the south eastern rim of the western area, and are distinctly traceable by the Alpalachian chain through Vermont into Canada, and through Canada to the Gulf of St. Lawrence; in this part constituting the north-western rim of the eastern area. But while in the western division there is no want of conformity from the Lower Silurian rocks to the carboniferous, and the plications there appear to be of a date subsequent to the carboniferous deposit, in the eastern there are evidences of a want of conformity between the Upper and Lower Silurian formations; and though the folds in the former do not seem quite so violent, they are in parallel directions with those in the latter. There is another and a greater want of conformity between the Devonian rocks and the carboniferous. A large portion of the carboniferous deposit of New Brunswick shows but very moderate dips, and on the shores of Bay Chaleur it lies in a quiescent condition on the tilted edges of the lower formations, sometimes resting on one and sometimes on another. Its north-western outcrop, however, or rather, I should say, the longitudinal axis of the whole coal-field from New Brunswick to Newfoundland, has a parallelism with the folds of the inferior rocks, and there are several parallel undulations in nearly the same direction on the south side of the carboniferous deposit.

The conclusion to be drawn from these facts appears to be, that some cause, producing folds in the stratification in one general direction, has been in operation from at least the cessation of the Lower Silurian epoch to the termination of the carboniferous; and it only requires the inspection of a map of Atlantic America to observe how the features of its physical geography, displayed in the configuration of its coast, in its valleys of undulations and those of transverse fracture, are almost entirely dependent on the results of this cause.

The fossiliferous rocks of both these divisions, with the exception of that part supported by the Cambrian formations of Lakes Superior and Huron, rest, along the valleys of the St. Lawrence and the Ottawa, upon a series consisting of micaceous and hornblendic gneiss, interstratified towards the south with great bands of crystalline limestone, sometimes highly charged with magnesia and associated with vast masses of magnetic iron ore, but without calcareous beds on the north. These rocks constitute a part of the low granitic ridge, which to the westward has been traced by Sir J. Richardson as extending with a north-westerly curve to the Arctic Ocean.

The Canadian rocks on the north side of this granitic ridge, as displayed toward the head of Lake Temiscamang, consist, in ascending order, of chloritic slates and conglomerates, with a slaty matrix; the volume of these is probably not less and may be much more than 1000 feet. On them rests a set of massive pale greenish-white or sea-green sandstones, the total amount of which, as determined by the height of hills which they compose in nearly horizontal layers, is between 400 and 500 feet. These are succeeded by about 300 feet of buff and whitish fossiliferous limestones, the lowest bed of which is composed of a collection of great boulders and blocks of sandstone, some of them nine feet in diameter, that were lying immediately on the strata from which they were derived when they became covered up, and in which great cracks and worn fissures are filled with the calcareous deposit that envelopes the whole. The sandstones being without discovered fossils, it is not easy to determine their age; but the limestones by their organic contents are distinctly shown to belong to the Upper Silurian epoch. The Lower Silurian deposits, unless the unfossiliferous sandstones be a member of the group, appear to be wholly wanting in the locality, and as all the forms brought from other localities on the north side of the granitic ridge by Bigsby, Richardson, and others, are, I believe, referable to Upper Silurian types, it appears not improbable that the absence of the Lower Silurian rocks may spread over an extensive area, and the south side of the ridge indicate an ancient limit to a Lower Silurian sea.

The nearest locality of the well-defined forms which inhabited this sea is at the island of Allumette, about 200 miles southward from the Upper Silurian rocks of Lake Temiscamang; there is, however, a patch of the same lower formation which is only about 100 miles southward from them, but in it the fossils are obscure. Instead of giving any remarks of my own on the fossils of the two sides of the granitic ridge, I shall append to my paper a note which my friend Mr. Salter, of the Geological Survey of the United Kingdom, has been so kind as to make on them after a careful inspection, only stating that the specimens which have been examined are but a small part of an important collection, chiefly from the eastern of the two divisions that have been alluded to, brought from Canada for comparison, and that twice as many specimens as have been brought remain in the Province from other parts, while great additions it is hoped will annually be made to them.

Louisburg, Cape Breton.

BY S. J. STRATFORD, M.R.C.S., ENG., TORONTO.

During the last summer, in a tour to our noble Eastern Provinces, fortune led my steps to explore the remains of the ancient city of Louisburg; and I was forcibly struck with the spectacle of lonely desolation which it now presents. The remains, however, of the extensive fortifications which are presented in every direction, plainly bespeak the former strength and importance of this maritime capital of La Nouvelle France. As the sudden destruction of a place so celebrated was a most unusual occurrence in the New World, I was naturally led to enquire into its history, and to collect material on the spot that should explain it; but as this, though replete with thrilling incidents, would be too extensive for the *Canadian Journal*, I must be content at present to offer but a few observations on the celebrated city, which appears to have been almost totally forgotten in Canada.

The town of Louisburg was situated upon the neck of land which jets out into the sea, westward of the islands which form the mouth of the harbour; was of an oblong figure and nearly two miles in circumference. It was fortified in a most scientific manner; while powerful batteries were built at all the most commanding points that could defend the entrance of the harbour.

The streets of the city were wide, and ran at right angles; the houses were principally constructed of wood, built upon stone foundations; but the public buildings were of more durable materials, stone or brick. The public buildings situated in the town were of an extensive character, and principally for religious purposes. There was the fine hospital of St. Jean de Dieu, to which was connected a church, dignified by the title of a Cathedral,—a really elegant and spacious structure; besides these

there was an extensive nunnery; and a by no means insignificant theatre. There were several gates in the different parts of the town; and on the north-east side was a spacious quay, where they had constructed a kind of bridge, called in the French language *Les Calles*, or wharves, which projected considerably into the sea, and were extremely convenient for loading and unloading goods. At this point there was a chain boom which extended in front of the quay, within which the ships were placed, and effectually prevented them being cut out by an enemy on a sudden attack. The fortifications consisted of two bastions, called the King and Queen; and two demi-bastions, distinguished by the names of Dauphin and Princess. The city was surrounded with a rampart of stone nearly three miles in extent; from thirty to thirty-five feet high; and a ditch of eighty feet wide, with the exception of two hundred yards near the sea, which was enclosed by a dyke and a line of pickets. At this place the sea was very shallow, and numerous reefs rendered it inaccessible to shipping, while it received an additional protection from the side fire of the batteries. The bastions were mounted with eight batteries, containing embrasures for 148 pieces of cannon; and there were sixteen mortars. The centre of one of them, the King's bastion, was occupied with a stone building, with a moat on the side towards the town. This was called the citadel, though it had neither artillery or a structure suitable to receive any. Within this building were the apartments for the governor, the barracks for the soldiers, and the arsenal. Under the platform of the redoubt was a magazine, well furnished with military stores. The parish church also stood within the citadel; and beside it there was a handsome parade ground. The entrance to the town was by the west gate, over a draw-bridge, near which was the Dauphin bastion, with a circular battery mounting sixteen guns, all fourteen-pounders. Adjacent to this battery had been erected spacious casernes or bombproof barracks, the remains of which are still to be found among the ruins of the city, and form objects of great curiosity for the inspection of the tourist.

The entrance of the harbour of Louisburg was defended by a battery almost level with the water, situated upon one of the islands that form its mouth. This was called the Island Battery, and was mounted with thirty-six pieces of cannon, all of which were twenty-four pounders. There was a battery situated at a mile and a half from the town opposite the mouth of the harbour. This was a very strongly built fortress, surrounded by a ditch, and flanked by two redoubts. It was mounted by thirty pieces of cannon, twenty-eight of which were thirty-six-pounders, and two eighteen-pound carronades. The remains of this battery are still obvious at the present day; and from their extent must have contained a barrack and a considerable magazine. From the quantity of cut-stone lying about, it is clear that it was a well-built fortress; and from its position it must have completely commanded the whole harbour, as well as have greatly aided in defending its entrance. At the Light-house Point there was a third powerful battery, where, from its high and commanding situation, elevated far above the Island Battery, it commanded not only that, but the town and the western part of the harbour, and was a great defence to its mouth. There was a Circular Battery, mounted with twenty guns, situated on the beach east of the town; and forming part of the fortifications which surrounded the city, was cavilier, pierced with twelve embrasures, called by the name of Marapas, which was also intended to strengthen the defences of the harbour. All around the coast without the harbour of Louisburg, the shore is everywhere bounded by bold and rocky precipices, whose breakers for the most part defy an hostile landing; but in every nook or creek where it was possible to run in a boat, we find that the French had erected defences, the remains of which are still sufficiently obvious at the present day.

Thus strongly fortified from an attack by sea, the city of Louisburg was still vulnerable from the land side. The high land which everywhere surrounded the harbour offered a means of attack upon any one of the principal batteries, provided the opposing force could obtain possession of it: thus flanked, the city could not be permanently defended. It would seem that the French engineers, in their operations, confided greatly in the rocky and inaccessible condition of the country in the rear of Louisburg, to strengthen their defences, and thought that if they could only guard the harbour's mouth from a naval attack, that the town was secure from the apparently impenetrable character of the country. Experience, however, fully proved the fallacy of that confidence, and was the eventual cause of the destruction of their defences.

The building of these extensive fortifications, and the other public works, necessarily employed many hands, and took many years for its accomplishment; it necessarily caused the arrival of many emigrants—artificers as well as labourers; that ere these works were finished, the city of Louisburg contained quite a respectable number of inhabitants; these, with the floating population employed in very extensive fisheries, a considerable coasting trade, and a large military establishment necessary to defend these extensive fortifications, there is little doubt that Louisburg might have numbered a population of 30,000 inhabitants. That the city enclosed within the fortifications would positively have contained that amount of population there is probably a doubt; but when we survey the extent of the harbour, and observe the numerous ruins along its shore, we shall cease to be sceptical of this fact. In one place we find the evident remains of an extensive brewery; in another of a considerable tannery; while the establishments for curing fish were certainly very numerous. And if we recollect that upwards of 500 vessels were employed in the taking of fish, we shall be convinced that the hands necessary to conduct such establishments must have been very numerous; and if we add to these the careening wharves and other places for the repair of shipping, with their various artificers; we certainly think that this calculation of the number of its inhabitants could not possibly have been very much over the mark.

The trade of the city of Louisburg during all this period must have been very considerable, as all the necessaries of life had to be imported by sea. The rocky and sterile country in the immediate vicinity of Louisburg harbour, without a very high state of cultivation, was perfectly unable to produce food for such an extensive amount of population as we have indicated; while the almost total want of settlement at this period in the other parts of the Island of Cape Breton, more adapted to agriculture, could not have been able to supply the deficiency; consequently the inhabitants were obliged to look to Canada and France for their supplies. In order to supply this deficiency, agricultural establishments were formed upon Isle St. John, or Prince Edward's Island, in the Gulf of St. Lawrence, which even at this early period had attracted the attention of the French, and was fully able with but slight development to supply the military establishments of Cape Breton; and for this purpose the Island was most strenuously guarded by the French government. The mere conveyance of the necessaries of life for so large a population must have required a considerable number of vessels; but when we find that all the materials of every description employed for building had to be transported in vessels from distant parts; that the stone, the brick, the timber the lime, and even the sand, had to be conveyed either from Canada, France, or the West Indies, our surprise that so large a fleet was employed in the commerce of Louisburg must cease. The necessity to transport all these materials by sea was dependent on the deficiencies of development and want of knowledge of the country, rather than on any lack of such material in the Island of Cape Breton. Later investigation clearly proves that building materials of every

description abound in the Island, and at no very great distance from the harbour of Louisburg; even had the different localities where these various materials abound been discovered, the want of proper roads on which to transport them would, in all probability, have prevented their being used.

In the simple article of sand, which invariably abounds upon the sea shore, experience proved had to be conveyed to Louisburg. The character of the mortar which is found among the ruins of the fortifications is sufficient evidence of the difficulty under which the engineers laboured for proper sand as a building material. The simple fact is, that in every instance in which the sea-shore sand was used the works speedily mouldered away and fell down, especially after they had been submitted to the action of the frost during winter. Mortar used in building is a silicate of lime; and when a large quantity of the chloride of sodium always found in the sea-shore sand is combined with it, the proper combination of silica and lime is impeded, and instead of becoming the hard durable material which characterizes proper mortar, it is friable, and easily disintegrated with the least moisture, depending in all probability on the chloride of calcium formed in the mixture. It is certain that after the engineers employed on the works of Louisburg had discovered their mistake, there existed a vast difficulty in remedying the defect, and of procuring sand free from salt. The whole Island of Cape Breton is surrounded and greatly indented by the sea; while all its inland parts were then totally inaccessible for want of roads, so that proper sand could not be procured nearer than Canada or the West Indies.

The greater part of the cut-stone with which the fortifications and other public edifices were built, had evidently from its character been imported from a distance; but the rough material extensively employed in the erection of the fortifications was clearly obtained from the neighbouring rocks; and immense quantities of such stone may be seen lying about in every direction, evidently quarried from the surrounding rocks: this had apparently been prepared for the extension or repair of the works.

The lime-stone and brick were also brought to the place: the lime-stone apparently from the West Indies, as we found numerous pieces containing corralines lying about in several places. The lime-stone was burned in a kiln situated upon the sea beach, and must have made excellent lime. The bricks were apparently brought from France. These articles in themselves would have rendered a large amount of shipping necessary in the conveyance of such bulky material, and certainly must have constituted a considerable branch of commerce.

The advantageous position of Louisburg, placed in the midst of the most productive fisheries in the world, would naturally have added vastly to its commerce. That there were at this time very numerous establishments for curing of fish in the harbour is evident from the ruins everywhere scattered about; and when it is shown that upwards of 500 vessels, of about 150 tons, were employed in catching fish, requiring a complement of over 10,000 men, it is evident that this business must have been very extensively carried on. It is affirmed that 5,800,000 quintals, of 112lb. each, of cured cod alone, were annually exported from Louisburg; and when we come to add the herring, mackerel, and salmon, with the seal and whale oil, we shall not be supposed to exaggerate the extent and importance of the commerce carried on at this time. Six hundred square rigged vessels, and many coasting craft, were necessary to do the business which all these different wants and services required; while the imposts and other duties accruing from this commerce, brought in an annual income to the French crown of upwards of a million and a half of livres.

As a striking instance of the vast amount of commerce carried on in the city of Louisburg, we find it stated that a M. Maillet de Granville, who had left France extremely poor, at the age of sixteen, had, by industry and application to business, advanced himself in the world so as to be able to purchase the lordship of Mount St. Louis, which cost him 80,000 livres; and that at the taking of Louisburg he lost property to the value of one hundred and fifty millions of livres, and was thereby left perfectly destitute.

From the above detail, also, it must be clearly evident that the erection of the extensive defences of the city of Louisbourg must have been built at enormous expense to the French nation, when all the materials, all the artizans, and even all the provisions consumed had to be brought from a distance, and that, sometimes, during a period of war. It is certain that upwards of 30,000,000 of livres were expended upon these works; and after the capture of Louisburg, King Louis the Fourteenth is said to have exclaimed, that he should have expected to have found the very streets of Louisburg paved with silver, from the great and continued drain upon his treasury which the maintenance of this establishment cost him.

The city of Louisburg has twice fallen before the power of the British arms. In the first instance it was taken by Sir William Pepperall and the brave New England Colonists; and secondly by the forces under General Amherst, assisted by the gallant Wolfe; when, chiefly at the instigation of the inhabitants of the city of Halifax, the British goverument resolved to destroy it; but even this operation is said to have taken upwards of a year, and to have cost £10,000.

The city of Halifax has always been jealous of the splendid and capacious harbour of Louisburg, and has invariably instigated the government to prevent its redevelopment; but situated 200 miles nearer to Europe than Halifax, it is pre-eminently the spot at which all the railroads on the American continent must terminate. Suppose, for example, two steam-ships coming from the eastward, off the harbour of Louisburg, (to which point they must come as a matter of necessity,) the one landing its passengers at this point, and dispatching them by railroad; while the other goes to Halifax, then forwards her's by similar means to Petticodiac, in New Brunswick, where all the railroads must meet: those sent from Louisburg will arrive full a day in advance of those dispatched from Halifax, and not have to go full one hundred miles out of their way to arrive at it. This fact, and the certainty of being able to cross the Gut of Canso—scarcely a mile wide, with a railway train at all seasons of the year—will again restore the city of Louisburg to the importance which its peculiar and favoured position unquestionably assigns to it; for, placed at the mouth of the Gulf of St. Lawrence, and at the north-eastern extremity of this portion of the American continent, steam-vessels destined either for Canada or the United States may here call for coal—of which there is abundance in the immediate neighbourhood—or land their passengers, to proceed by rail to any part of the American continent, without going a mile out of their way.

At a subsequent period, should it be judged worthy of consideration, I shall willingly detail the present condition of the harbour of Louisburg, especially the ruins of the ancient city, and point out from its favoured position its applicability, not only to be the chief railway station upon the American continent, but the point of communication for the great Atlantic magnetic telegraph; for the chief mart of the great fisheries in its neighbourhood; and, pre-eminently, for the best location for a great watering place for the valetudinarian, to be found upon this continent.

Davis's Report on the Nautical Almanac.*

Our readers may not be aware that the American Nautical Almanac, established by Congress some three years since, and placed under the supervision of the Navy Department, is already so far advanced, under the able superintendence of Lieut. C. H. Davis, that a few weeks will witness the appearance of the first volume, computed for the year 1855. The ability and position of the gentlemen charged with the execution of the work, affords the best reason for expecting a publication which shall materially add to the scientific reputation of our country.

The attention of our legislators has recently been recalled to the subject by a series of most singular resolutions offered in the United States Senate by a distinguished member of that body, whose philanthropy is evidently more enlarged than his astronomy. The resolutions of inquiry, with the answers appended to each by Lieut. Davis, were as follows:—

1. *That the Secretary of the Navy be instructed to inform the Senate where, and at what observatory, the observations and calculations for the "Nautical Almanac" are made.*

This inquiry comprises several distinct interrogatories, which, with your permission, I will answer separately.

The calculations of the Nautical Almanac are made at no observatory, and have no direct connection with or dependence on the current duty of any particular observatory. The daily duties of observatories, and of offices like this of the "Nautical Almanac and Astronomical Ephemeris," are perfectly distinct from each other. The business of the observatory proper is to record events and appearances, and to make the calculations requisite to render these records immediately useful to the astronomer; it also endeavours to add to the sum of knowledge bv the discovery of new facts, and the observation of new truths and phenomena, as exemplified by the frequent discovery of planets and comets, and the constant observation of those, the periods of which are still to be investigated; by the study of the nature of comets,—of the rings of Saturn,—of the comparative brightness of stars and planets, &c.

The business of the office of a "Nautical Almanac and Astronomical Ephemeris" is to *predict*, one or more years in advance, the events and phenomena, the actual occurrence of which the observatory records, and which the navigator compares, observes, and calculates, while on the otherwise pathless sea, in order to pass in safety from country to country.

The calculations of the Nautical Almanac are made principally at Cambridge, the residence of the present superintendent, where the printing of the work can be conducted most expeditiously, most economically, and, what is still more important, most accurately: and where convenient reference can be had to the best scientific libraries of the country, an indispensable aid in laying the permanent foundation of a work of this magnitude and importance.

Bnt as the superintendent of the almanac has succeeded in engaging the limited services of some distinguished mathematicians and astronomers in other parts of the Union, a portion of the computations have been made elsewhere; for example: by Professor Winlock, of Kentucky; by Mr. Sears C. Walker, of Washington; by Professor Kendall, of Philadelphia; by Professor Smith, of the Wesleyan University, at Middletown; and by Miss Mitchell, of Nantucket.

The observations used by the Nautical Almanac, that is the observations on which the fundamental laws of the astronomical prediction are based, have not been made at one observatory, but at all observatories; not at one place, but at all places of correct and well-attested observation on the globe; not at one time, but in all times of authentic history.

2. *Why the same are not made at the National Observatory at Washington?*

Whenever, in the progress of theoretical information. or in consequence of entirely new discoveries, or for the purpose of anticipating the official publication of printed volumes, it has been occasionally desirable and expedient to have recourse to an observatory, the National Observatory at Washington is the *only one* to which the superintendent of the almanac has applied for information.

The superintendent of the National Observatory has been requested, for example, to make some meridian observations of stars of comparison, which were used in the reduction of those observations of the planet Mars which have been made during the last hundred years at the Greenwich observatory; to test by immediate observations the accuracy of the elements of the new planet Iris; to furnish from the records of the observatory certain information in anticipation of the next printed volume of the "Washington Observations;" and to direct the attention of the observers towards the new planets discovered since the year 1827, concerning which astronomical history supplies, of course, no information, and concerning which all our knowledge is to be gleaned from future observation.

But it is the printed and published transactions of this and other observatories, in which the observations, &c., are given to the world in their reduced and complete and final form, that are employed in the large computations of the almanac, and not the separate observations made at the various instruments from day to day, in the prosecution of a great scientific enterprise.

3. *What expenses are necessary therefor, except the pay of the superintendent?*

The pay of computers, the cost of publication, including composition, press-work, and correction; paper, books, &c., &c.; the expense of stereotyping; the printing of auxiliary tables for computation, of blanks, of instructions, and mathematical formulas and methods.

4. *What progress has been made towards making a Nautical Almanac?*

The first volume is nearly completed, and its printing far advanced. All the main and heavy computations are done.

5. *For how long a period the calculations of the first almanac are expected to extend?*

For a period of one year; the first number of the almanac will be published in the year 1852, for the year 1855.

6. *Whether it is necessary to the perfection of the Nautical Almanac to make observations at more than one observatory; and, if so, are they made at two observatories; and, if so, at what two?*

The reply to this question is partly comprised in the reply to the first question.

If all the established observatories in Europe and elsewhere published to the world the results of their labours in the same convenient, complete, and elegant form as the observatories at Washington and Greenwich, they would not be too numerous for the wants of those astronomers who devote their attention to the improvement of the theories of planetary motion. And it is from these *published* volumes, of whatever date, that the almanac derives its useful and serviceable facts and information.

* Silliman's Journal.

The "Washington Observations" of 1846 have supplied the mean places of what are called the "fundamental stars;" and this volume, together with subsequent observations at the same instruments, not yet printed, have enabled computers to employ a more exact measure of the sun's diameter.

For this and similar reasons, it has been correctly said that the National Observatory now contributes to the general sum of the requisite materials for making an almanac of our own.

7. *Whether any persons except the superintendent have been paid for services in preparing the "National Almanac;" and if so, how many, and what compensation have they received?*

A list of the computers and other persons employed in the office of the Nautical Almanac is hereunto annexed; and also a statement of the number of persons, except the superintendent, who have been paid for services in preparing the Nautical Almanac, and the compensation they have received up to the last payment.

8. *When is it expected that a Nautical Almanac will be prepared for publication?*

The reply to No. 8 is contained in that to No. 4. It is expected that the first volume will be ready for sale and distribution in about three or four months.

9. *What improvement, if any, is it expected the American Nautical Almanac, when published, will have over the English?*

The American Nautical Almanac has made improvements upon the English in the ephemeris of the moon, and that of most of the planets. It has rejected the lunar tables of Burckhardt and Damoiseau, now pronounced obsolete; and has constructed lunar tables for its own use, which embrace the corrections of Professor Airy, deduced from the lunar observations made at the Royal Observatory, Greenwich, from 1750 to 1830, and the corrections arising from the discovery of Hansen. It is only necessary to turn to the last published volumes of the Washington or Greenwich observatory to become acquainted with the errors and irregularities that abound in the ephemeris of the moon, very often extending to one-third of a minute of arc. The determination of the longitude at sea, however, by the method known as "the lunar observation," the only method employed in the common practice of navigators, where chronometers are wanting or are untrustworthy, or require verification or examination of their rates, depends essentially or intrinsically upon the accuracy of the moon's predicted place. Now, this error of one-third of a minute of arc involves an error of ten miles in the determination of a ship's longitude at sea.

The lunar tables, prepared in the office of the Nautical Almanac, reduce the average errors in the moon's place, as derived from the obsolete tables, and given in the British Astronomical Ephemeris, to one-third of their amount; and a distinguished gentleman of Philadelphia, Mr. Miers Fisher Longstreth, has since published an improvement of the lunar formula, which has probably reduced this remaining error by two-thirds. Mr. Longstreth's corrections have been embodied in the new tables of the almanac, and thus, owing to the genius and labours of Pierce, Longstreth, and other distinguished astronomers, the almanac has it now in its power to predict the moon's place in the heavens with a degree of precision far surpassing anything heretofore attained elsewhere. And the proof of this is at hand. Whilst the lunar tables were in the course of preparation, the Department, in a letter dated August 5, 1850, authorized the superintendent of the Nautical Almanac to publish his predictions and elements of the total eclipse of the following year, July 28, 1851, for the express purpose of testing the accuracy of the new tables, and of acquiring the means of other improvements; and on the 25th of August, 1850, the superintendent, by permission of the Department, communicated the predictions of his office to the American Association for the Advancement of Science, at that time in session at New Haven; he, at the same time, announced to the mathematical and physical section of that body, the preparation of the new lunar tables, and submitted to its criticism and approval the objects in view, and the mode in which they were to be accomplished. His communication is contained in the printed proceedings of the Association at that meeting.

The event proved highly satisfactory, by showing conclusively the superiority of the lunar tables now in use in the office of the American almanac.

For the prediction at Cambridge the British almanac was in error eighty-five seconds, and the American almanac only twenty seconds.

At Washington, the British almanac was in error for the beginning of the eclipse seventy-eight seconds, and for the end sixty-two seconds. The American almanac was in error for the beginning only thirteen seconds, and for the end only one second and a half.

The observations were made by Mr. Sears C. Walker, at Cambridge, and by Professor Hubbard and Mr. Fergusson (and communicated by Lieut. Maury) at Washington. Where the eclipse was total, and where, for this and other reasons, the test was more rigid and conclusive, the result was still more gratifying and decisive as to the superiority of our own lunar tables. The same tables of the moon are used in the French and Berlin almanacs as in the British; the errors, therefore, are the same. The errors exposed in this eclipse may give rise to an error of from fifteen to twenty miles in the determination of the longitude at sea by means of lunar distances, and to an uncertainty of twice that amount. The possibility of such an error, arising from this source, is removed in the American ephemeris.

It may be mentioned, among the benefits conferred by these lunar tables, that they bring into practical availability a large number of "moon culminations," as they are technically called, observed by the astronomers of the coast survey on the western coast of the United States, which have been hitherto lost. These observations are made on the land for the nice and accurate determination of geographical longitudes, and in that now difficult and extensive field of labour are of the highest importance: owing, however, to the imperfections in the tables, by means of which the place of the moon in her orbit is computed, no other observed "moon culminations" can be usefully applied than those which have been correspondingly observed elsewhere. That is, these "moon culminations," to be available, must be observed at the same date at two different places. In consequence of this necessity, some six hundred or more of the observations made in California and Oregon, to be found in the books of the coast survey, have been laid aside "for want of moon's places more reliable than the British Nautical Almanac can give us."—[Letter of A. D. Bache, superintendent United States Coast Survey, to the superintendent of the Nautical Almanac, Nov. 20, 1851.]

It was said that the ephemeris of the planets has been improved. The ephemeris of the planet Mercury will be derived, for the first time, from the new and elegant theory of M. Le Verrier.

In preparing the ephemeris of Venus, with that of Mars, the correctness of Lindenau's elements of the orbits of these planets, deduced from the Greenwich planetary observations from 1750 to 1830, by Mr. Hugh Breen, have been for the first time introduced. But some labour has been bestowed in combining the rough groupings of Mr. Breen in such a manner as to carry forward the corrections uninterruptedly; all his results have also

been discussed anew, according to the method of least squares, and the work is left in such a form that the observations of all observatories, particularly those of Washington and Greenwich, on account of the complete form in which they are given to the world, can be used from year to year, for the continued improvement of the elements of the planets. The perfection of the places of these planets is the more important and valuable that they are used very constantly in lunar distances by the navigator, and their errors are highly magnified at the time they are best seen and most useful, by the greater relative change in their distances from the earth than in those of the other planets employed in this way.

In preparing the ephemeris of Jupiter and that of Saturn, as well as in those of the preceding planets, all the errors and alterations pointed out by Professor Airy in the introduction to the Greenwich Planetary Reductions, have been corrected and adopted and the tables of Bouvard and Lindenau have been entirely remodelled and reconstructed for the convenience of computation. But it is well known to astronomers that the theory of Jupiter and Saturn demands a thorough revision; and their combination presents a case of peculiar difficulty, which has been ably treated by Professor Hausen. To prepare Hausen's theory for use in practical computation, is a work of time. It will be entered upon immediately, and will probably be completed in the course of two years.

In the case of Uranus, there are no tables which can be relied upon. Professor Pierce's theory, combined with the researches of LeVerrier, will, for the first time, form the basis of the new ephemeris of Uranus.

With regard to the new planet Neptune. the world has already accepted with grateful acknowledgments the labours which American astronomers have conferred upon it with illustrious success. The computation of the tables of the perturbations of Neptune, by Professor Pierce, and the computation of the elliptic elements of Neptune, by Mr. Sears C. Walker, have resulted in the preparation of an ephemeris, by the last named gentleman, which admits of no sensible correction.

The ephemeris of the fixed stars has also been improved by the introduction of the latest and most approved constants of precision, nutation, and aberration.

The general list of occultations has been very much extended, in order to make it especially useful to geographers in general, the boundary and other surveyors of the government in the interior, to the coast survey of the United States on both oceans, and the explorers of unknown parts of the continent.

Other changes regarded as improvements might be recited. The astronomical part of the ephemeris has been adapted to the meridian of Washington; siderial dates have been introduced; what is believed to be a more correct obliquity of the ecliptic has been adopted; and more convenient forms and a better typographical execution are kept in view. A work comprising such a multiplicity of details may admit of many similar amendments.

To the above it should be added, that an entirely new reduction has been made of the early Greenwich observations of Mars, by Bradley, Bliss, and Maskelyne, preparatory to a new theory and to new tables of this planet.

A new method, with new tables, of clearing lunar distances will be given in the first number of the almanac, in which improvements are presented leading to the correction of errors of ten, fifteen, or twenty minutes in the longitude, common to the methods at present in use; which errors may, in rare cases, amount to a whole degree.

There are two other signal advantages to be derived from the publication of the Nautical Almanac, the mention of which should not be omitted: they concern the navigator, surveyor, astronomer and geographer.

One of these is a more complete, full, and accurate table of latitudes and longitudes, particularly of American latitudes and longitudes, than is now anywhere to be found.

These positions also embrace in their number the most conspicuous towns and trigonometrical stations, with their magnetic and astronomical bearings, along both sea coasts, and as far in the interior as the operations of the coast survey extend. When, therefore, the American surveyor or astronomer of a boundary commission opens the almanac for the requisite astronomical data of his observations, he may find also such terrestrial data as will answer for the proper basis of his field work, and at the same time as the standard of accuracy to his own independent computations. To meet his wants, some additional constants will be occasionally inserted,—as height of station above the sea, mean barometric pressure, variation of the needle, &c. And as a separate list of the latitudes and longitudes of the principal observatories of this country and in every quarter of the globe is a customary part of the almanac, so the stationary astronomer will, in turn, find his purposes served. An assistant is employed in verifying the positions in the world generally, given in the best European lists; and a suitable selection will be made from the determinations of the offices of hydrography, topography, and the coast survey, to enrich the American table with the best and most numerous list of American geographical positions extant.

Similar tables are published in the French almanac; but no such tables, with the exception of the observatories, are given in the British. This, therefore, is regarded as another improvement in the American almanac upon the latter.

The other signal advantage spoken of, relates to the subject of the tides. The conduct of a general system of tidal observations, their reduction, and their scientific discussion, by which is evolved the rules for the prediction of the tides, are all the property of the hydrographical and astronomical departments of the coast survey. But it is the province of the Nautical Almanac to present the results of these various labours in a manner suited to answer the practical demands of navigation and engineering.

It will not perhaps be irrelevant to cite a single case under the general problem of the tides. In order to be able to give rules practically useful to the pilot, engineer and seaman, for applying to the ordinary tides, corrections depending on the moon's varying distance and declination, it is necessary to know to what meridian passage, or southing of the moon the tide is due; or, what the distance is from the land of the general tide wave that causes the local tide which the observer is actually registering; or, in fine, what is the age of the tide when it arrives at any particular part of our coast. This knowledge is the result of the careful study of a large number of observations made at various points. The age of the tide at London differs from that at Key West; and that of Key West again from that of New York, or Hampton Roads.

Our exclusive dependence upon European authority for that knowledge of our coasts which no European authority can, from the nature of the case, supply, has been a disadvantage and a reproach. Both the disadvantage and the reproach the American Nautical Almanac will help to remove by making use, as it has been authorized to do, of the materials in the records of the coast survey, for furnishing a tide table founded on the actual observations of tides in our own northern and southern harbours, and their subsequent reduction and discussion in the office of that institution.

One consequence of the announcement of the preparation of

the American Nautical Almanac, may be noticed here. It has reduced the price of the British Almanac by one-half, that is from 5s. to 2s. 6d.

The Counter effect of a restoration of the British monopoly in the American market will probably be a return to the former price.

10. *Is it expected that any errors of former astronomers or observers, are to be corrected, or any new means suggested by which more precision is to be given to astronomical science?*

This inquiry is, for the most part, answered in the reply to the preceding question.

11. *After the first Nautical Almanac is published, will the succeeding numbers probably cost as much, or more than the first?*

After the first volume of the Nautical Almanac is published, it is estimated that the sum of $19,400 will be the probable cost of the succeeding volumes; and this sum is not more than sufficient to allow the first class computors, who must be gentlemen of liberal education and of special attainments in the science of astronomy, the lowest salary paid for similar services in other offices of the Government. The annual estimate for the British Almanac is between sixteen and seventeen thousand dollars; but, generally speaking, intellectual labor commands a higher compensation in this country than in Great Britain.

A portion of the appropriation will be returned into the treasury every year when the sale of the book commences. The cost of the first number includes the expense of the various works of preparation already detailed. These preparatory productions are permanently useful; they are the instruments to be employed in the computation of all future numbers. If the American Almanac should be continued uninterruptedly for as long a period as the British has existed, the cost of preparation, thus distributed, would amount to about two hundred and twenty-two dollars a number.

12. *Will the same time be necessary for the second and subsequent numbers, respectively as for the first?*

The succeeding numbers of the Almanac will appear annually, three years in advance of the year for which they are computed, according to the custom in England, France and Germany. The time spent in the computation of each number will be one year.

Finally, in reply to this resolution in general, let it be said that the *Nautical Almanac and Astronomical Ephemeris* is not a work of insignificant value, or of trifling labour. It has been viewed by the Department, and is considered by American astronomers and mathematicians as a work of consummate utility and of real national importance, resembling in this respect the *Nautical Almanac and Astronomical Ephemeris* of Great Britain, the *Connaissance des Temps* of France, and the *Astronomical Annual* of Prussia.

On one hand, it is the text-book of the navigator. It informs him of his place on the ocean, where there are no other guides than the sun and stars. It is his intellectual rudder and compass; without it no ship-master leaves the shores of the United States. When he loses sight of the last light-house or head-land, he turns to that for his further directions.

On the other hand, it is the *vade mecum* of the astronomer, whether stationary or travelling. He learns from in the fixed observatory how his instruments must be set that he may see any particular body, and what is the precise moment for observation: and in the moveable observatory he turns to its pages to ascertain how, on any given day, he can best determine his latitude and longitude, the astronomical bearings of his stations, and the rate and error of his chronometer. Thus, as the tables of the Almanac owe their origin to the labours of their observations, so, they repay the obligation by affording the most ready and complete facilities by which those labours are, at the present time safely and expeditiously conducted.

The Ancient Miners of Lake Superior; by C. Whittlesy.*

(Concluded.)

If copper utensils had been common among the Indians, they would have been preserved, and handed down to our times, or at least to the times of the Jesuits; for, before then, they had no iron or steel, and no metal but copper. If they had the ingenuity and skill, which has been claimed for them in providing themselves with implements, they would have manufactured something like an axe, as the Aztecs did, and would never have lost the use of it. As the Jesuits mention only stone axes, and say, that the Indians had neither hatchets or kettles, I conclude that "Loons Foot" is mistaken, when he asserts that they had copper axes. I will now give some reasons for ascribing the working of these ancient mines to the *Aztecs* or "mound builders."

The character of the mining works, is that of a people, having about the same advancement and intelligence as is exhibiied in the construction of the earth-works and fortifications that are visible throughout the west. There is in neither, any evidence that they had iron or steel, or the art of hardening copper, as the Egyptians had. In the mounds, and in contact with the skeletons that were interred at their base, are found copper ornaments, axes, and tools, of great variety and in great numbers. They are all fully described in the work of *Squier* and *Davis*, to which I have referred.

The copper is apparently *cold wrought*, and does not show that it has been melted. It must, therefore, have been found by the mound-builders in its native state, and there are no mines in North America, known at this time, from which native metal can be had, except those of Lake Superior.

There is a peculiarity about this copper, not known in any other mines, which serves still farther to identify the locality from whence the Aztecs procured theirs. The silver which it contains, is also in its native state, in particles, blotches and masses of pure white, studding the surface of the native copper.

Copper has been found in the mounds, in which specks of silver are plainly visible. Dr. Locke, of Cincinnati, has a rough sheet of it, taken from an ancient work at Colerain, Hamilton Co., O., where there is a spot of native silver, of the size of a small pea. This shows conclusively, not only that it came from Lake Superior, but that it has not been melted.

In the old works of the "Minnesotah" location, near the forks of the Ontonogon River, here was found, at the depth of 18 feet, a mass of copper, weighing 11,588 pounds, which had been taken out of the vein by the ancients. It had been raised a few feet along the slope of the vein by means of wedges and of *cob-work*, made of logs, laid up in the form of the body of a small log house. I had a piece of one of these logs, which was cut from a black oak tree about six inches in diameter, showing distinctly, the marks of a narrow axe, 1¾ inch wide, and very sharp. The character of the cut or stroke, made by the axe, struck me at once, as such as the copper axes would make, that I had seen in Ohio, which were taken from the mounds.

Although, the timber beneath the mass of copper, in the old Minnesotah works, was very soft and tender, by reason of its age,

* Annals of Science—Cleveland.

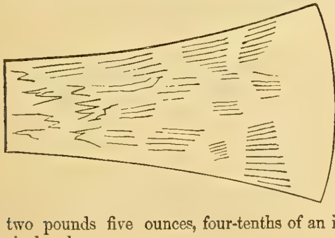
it had not rotted from exposure to the atmosphere, having been always covered by water. The timber was of a dark color, and shrank very much on drying; but the marks of the instrument by which it was cut off, were as plain and as perfect as they were on the logs and stumps recently cut in the vicinity. Directly over the mass, and over the timber which supported it, there stood, on the rubbish that covered the mass, about 12 feet in depth, a hemlock tree, that had recently been cut down, on the stump of which I counted (290) two hundred and ninety annual rings, or layers of growth. Other older and larger trees had come to maturity, fallen, and rotted away on the same ground.

I have another piece of timber which I take to be white cedar, that I procured from an extensive ancient rock excavation in the side of a mountain, forming an artificial cave, about four (4) miles south-east of Eagle Harbor, on section 17, T. 58, N.R., 30 west. It was presented to me by Dr. Blake, the Agent of the Company, who was engaged in reopening the mine, and who found among the rubbish, a wooden shovel, a part of a wooden bowl, that had been used to bail water, and troughs of cedar bark for carrying off the water.

This shrunken and withered wooden "bat" or *shovel*, is more decayed than most of those found by Dr. Blake, because it was a part of the time out of water. Some others that I saw were less rotten, in fact, were merely water soaked, and showed the marks of the knife or other shaving tool by which the handle was fashioned. They generally resemble an Indian paddle, in size and form, but some of them are worn unequally as though they were used side wise. The one I have was taken from the loose materials thrown out from the cave so long since that the trees, of the usual size and kinds, were growing upon the "burrow," or spoil bank. A birch about (2,) two feet in diameter, stood immediately over this shovel, the lower roots of the tree scarcely reaching to it, through the ancient rubbish. The marginal cut represents in outline, one of these shovels, length three-and-a-half feet, *a a*, form of one after use, from the Aztec cave, four miles south-east of Eagle Harbor; *b b*, form of the one I have, showing it had been used for scraping sidewise.

They have been found at the Copper Falls mine, and all of them are made of white cedar, which is abundant on Lake Superior.

The end of the stick or skid has the ma ks of a tool like a narrow axe, but not as broad or as perfect as those on the Minnesotah specimen which I was obliged to leave at the Ontonogon River, and which has been lost. The outline cut below represents a copper axe found near Chillicothe,

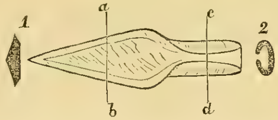


weighing two pounds five ounces, four-tenths of an inch thick, and seven inches long.

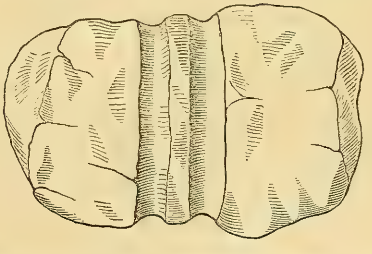
The cuts on the piece I now have are made with a duller tool, and apparently, having a curved edge like an adze. An axe or adze, of that kind, has been found in one of the mounds in Ross county, Ohio, It is figured and described by Mr. Squier, and also two other kinds of axes, and the mode of fastening a handle or helve to them, on pages 197–8–9 of the "Contributions." As yet no such axes have been found on Lake Superior. The only implements found there, which are made of copper, and which are from the rubbish of the old works at a depth of five to fifteen feet below the present surface, are figured below.

One is a chisel, an inch wide, with a bevel edge and a socket to receive a wooden handle, and is five inches long. Another is a "gad," or wedge, such as quarry men now use, and is four inches long, both of which are figured and described in the report of the Geologists, for the year 1850, and are from the Minnesotah ancient workings.

The third is a spear-head, in the possession of S. W. Hill, Esquire, of the Copper Falls mine, four and a half inches in length, which had the remains of a handle in it when found. It is represented below, the section through the line *a b* is shown at 1, and the section across the shank *c d*, is shown at 2.



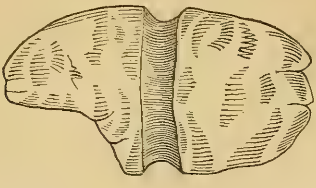
The "gad" is the only implement of metal, as yet known, which was then used in mining. The rock was excavated principally by the use of *fire*, by means of which the mass was softened, and fractured. The main implement made use of to break up the wall rock and vein stone, after it was calcined, was a *stone maul* or "hammer," shown in this cut which represents



a maul with double grooves, weighing 39½ pounds, it is twelve inches long, five and a half inches wide, and four inches thick.

These broken and cast-away mauls are seen in great numbers among the rubbish of all the old works, weighing from two to thirty-six pounds. They were handled, in all probability, by putting a withe around the middle at the groove. The wall rock that is left standing on each side of the vein appears to have been bruised and worn away by incessant pounding with these mauls. One from the Copper Falls mine, broken by use and having but

a single groove, is in the possession of Mr. S. W. Hill, and is here figured in outline, as viewed edgewise:—



No distinct marks of a metal tool have been seen in these works. The "gad" must have been used as at this day, by driving it into the cracks and fissures of the rock, to break out fragments. Other mining tools will probably be found, such as picks, or something answering the purpose of them.

The traces of fire and heat are frequently visible in the remains of charcoal and ashes, far down in the wrought veins, and on pieces of blackened rocks, among the rubbish.

There are mines of copper now wrought by fire, at Rammelsburg, in Germany, and which have been in operation for a great length of time, many hundred feet beneath the surface.

There are, also, in the county of Munster, in Ireland, on the Lakes of Killarney, mines of copper, supposed to have been wrought by the Danes, which have shafts 300 feet deep, and which were wrought by the agency of fire. In the same mines are found hammers or mauls of stone, the same as those of Lake Superior, with grooves around the middle.

It is, therefore, not impossible to work very extensive mines without the use of powder, or even without the use of any instrument of iron or other metal.

The Danes may have had iron tools, for there are marks of wedges visible on the sides of their shafts; but they knew nothing of the mode by blasting, for powder had not been discovered at that time.

The civilization and general state of advancement of the Danes must have been similar to that of the mound builders, if we may be allowed to judge by the monuments they have left behind them.

There has not been observed on Lake Superior any remains that indicate the existence of cities, or permanent houses of earth or stone. Mr. Hill is of the opinion that he has seen two "mounds" or tumuli, near the Ontonogon, that are artificial and ancient. These are the only known works resembling those of Ohio, except the gravel pits about the Portage Lake. There is nothing to show that the country was permanently inhabited by the ancient miners; and as their works were open cuts, and not galleries, it must have been almost, if not quite, impracticable to work them in the winters of that latitude.

No *graves* or human remains have been found here that can be referred to the era of the copper workings. Neither are there any evidences that there were furnaces or places where copper was *refined* or *melted*, or where it was crushed in the rock and afterwards separated by washing, as we do now.

It seems most probable that the people did *not reside* in the country, but came in the summer from a milder climate, bringing their provisions with them, and taking away, on their return in the fall, the metal they had raised.

In that case the numbers who would die in this healthy region would be small; and no large towns would be built, or permanent habitations, such as would be likely to survive to our times.

It is thus by analogies and by proofs that we may connect the ancient copper-miners of Lake Superior with the "mound-builders" and the Aztecs.

It is a question of some interest how much *time* has elapsed since these mines were worked, and also since the Aztecs abandoned the valley of the Mississippi. I think there is some evidence showing that the two regions were deserted by them about the same time; and this strengthens the presumption that all was the work of one people.

The timber which remains in the ancient diggings of Lake Superior is in a better state of preservation than that found in the mounds; but not more so than would naturally result from the coldness of the climate, the greater durability of the timber itself, and the fact that much of the timber of the mines is and has been continually covered with water.

In the Grave-creek mound, and in others, the crib-work or enclosures of the Aztec skeletons are of wood, and it is found to be very rotten; but these are in all cases above the level of the soil, the earth which surrounds them is dry and artificially raised, and into which the atmosphere penetrates.

Although some of the cedar and pine timber from the old copper mines is still comparatively sound, like this piece taken from a pit on the Copper Falls location, eighteen feet below the surface; all the well-preserved pieces were from wet places or under water. The trees from which the mound-builders constructed their burial vaults are less lasting than the northern timber, if both kinds were placed in the same circumstances.

Timber may be preserved under water and constantly wet earth many thousand years. I have in my possession many pieces of cedar from the "stratified drift" or "diluvial deposits" on which this city is built, that must have been buried many thousand years before man was placed upon the earth; and these specimens are as solid as the old oaken crib-work taken from the Minnesotah mines. They are even more solid than this ancient cedar shovel, taken from the Eagle Harbour location, and presented to me by Dr. Blake, and which was sometimes not covered with water. The ancient cedar trees beneath our town were from twelve to twenty feet from the surface, and were always either wet or moist. All circumstances considered, the time indicated by the timber-remains of Lake Superior is as great as by that taken from the mounds, and both may have been left there two thousand years ago.

There is a very sure guide that may be followed in determining the *shortest space of time* since the mines and the mounds were abandoned, and that is the age of the growing timber which stands upon them. There are living trees now flourishing on these ruins which are more than three hundred years old.

On the same spot there are the decayed trunks of a preceding generation or generations of trees that have arrived at maturity and fallen down from old age. It is also a matter of common observation, that where land has been cleared and remained a long time in cultivation, if it is abandoned, a different *kind* of *timber* from that which was cut away first springs up and has its day. It is only by a slow progress of encroachment that the ancient and surrounding forest trees regain their dominion over the soil; and thus it is only after generations have passed away that the new growth is crowded out and disappears. On the ancient earth-works, and on the ancient mining-pits of the North,

the same kind of timber is seen as that which occupies the adjacent forest.

This carries us back through a period of at least 600, and probably of 1000 years, as the *limit* within which this country has *not been* occupied either by the old copper-diggers or the race of the mounds. We have historical evidence from the Spaniards that North America was occupied by the Aborigines three hundred and sixty, and from the Icelanders eight hundred and fifty one years ago. If they came as emigrants from Mongolian tribes of Asia, a long period must have elapsed after their arrival in order to allow of such an increase of their numbers.

The natural increase of civilized nations is much greater than of barbarous ones; and in the former case it does not exceed 100 per cent. in 40 years. The Mongolians may have passed freely from Asia to America, as the "Esquimaux" or Eskimo do now in their "kinks," made of skins; but there is no apparent reason for an emigration more rapid than the surplus population would demand. Upon the whole, it seems that it must be since the Aztecs left, and the Indians assumed the middle States of the West, from 1500 to 2000 years.

A long period must have elapsed between the first appearance of the Aztecs upon our soil and their exodus to the South, during which the copper mines were wrought, the mounds, earth-works, and fortifications built, and the rich lands of the Western States cultivated. If we add one thousand years for their occupation of the Northern States, it does not carry us back beyond the foundation of Rome [753 years B.C.]; and when Rome was built the ruins of Pæstum were so ancient that no one knew, from history or tradition, the people who erected those fallen structures.

Cleveland, August, 1852.

Extracts from Exhibition Lectures.

Iron Smelting.—Let us select the smelting of iron as an example of the teachings of Chemistry. If practice, unaided by Science, be sufficient for the prosecution of manufactures, this venerable art must be thoroughly matured, and Science could scarcely expect to be of much use to it in its present state. But while we find much to admire in the triumphs of practical Experience, there is yet great room for the improvement of this art. The cheapness of iron ore, and of the coal used in its smelting, has been so great, that, regardless of their capital importance to this country, we, like careless spendthrifts, use them without thought of the future.

The mode of smelting iron consists in mixing the ore with lime and coal, the former producing a slag or glass with the impurities of the ore, while the coal reduces the oxide of iron to its metallic state. Much heat is required in the process of smelting, but the cold air blown in, as the blast, lowers the temperature, and compels the addition of fuel, as a compensation for this reduction. Science pointed to this loss, and now the air is heated before being introduced to the furnace. The quantity of coal is wonderfully economized by this application of Science; for, instead of seven tons of coal per ton of iron, three tons now suffice, and the amount produced in the same time is increased nearly sixty per cent. Assuredly this was a great step in advance. Could Science do more?

Professor Bunsen, in an inquiry in which I was glad to afford him aid, has shown that she can. We examined the furnaces, in each portion of the burning mass, so as fully to expose the operations in every part of the blazing structure. This seemingly impossible dissection was accomplished by the simplest means. The furnaces are charged from the top, and the materials gradually descend to the bottom; with the upper charge a long graduated tube was allowed to descend, and the gases streaming from ascertained depths were collected and analyzed. Their composition betrayed with perfect accuracy the nature of the actions at each portion of the furnace; and the astonishing fact was elicited that, in spite of the saving produced by the hot blast, no less than $81\frac{1}{2}$ per cent. of fuel is actually lost, only $18\frac{1}{2}$ per cent. being realized. If, in round numbers, we suppose that four-fifths of the fuel be thus wasted, no less than 5,400,000 tons are every year thrown uselessly into the atmosphere, this being nearly one-seventh of the whole coal annually raised in the United Kingdom. This enormous amount of fuel escapes in the form of combustible gases, capable of being collected and economized; yet, in spite of these well-ascertained facts, there are scarcely half-a-dozen furnaces in the United Kingdom where this economy is realized by the utilization of the waste gases of the furnace.

Large quantities of ammonia are annually lost in iron-smelting, which might readily be collected. Ammonia is constantly increasing in value, and each furnace produces and wastes at the least 1 cwt. of its principal salt daily, equivalent to a considerable money loss. With the low price of iron, this subsidiary product is worthy of attention. As I write, a Welsh smelter has visited me, to say that he has adopted this suggestion with advantageous results. I might adduce other improvements introduced by Chemistry in the smelting process; but these will suffice to show you that she has added to human power by increasing production, while she has also economized both the time and the materials employed.

Textile Fabrics.—Without the aid of Chemistry, it would have been impossible for textile fabrics to have attained their present development. The bleaching of cotton and linen was not much practised in England until about a century since; before that time they were sent to Holland, where the operation of bleaching consisted in steeping them in potash for a few days, afterwards for a week in buttermilk, and then exposing them for several months on a meadow to the influence of the sun and moisture. A great improvement was made in Scotland by substituting sulphuric acid for sour milk; and the immediate effect was to reduce the time from eight to four months. In 1785, a French Chemist suggested the use of chlorine as a means of hastening the process; and in the last year of the eighteenth century a compound of this gas with lime was introduced by Tennant of Glasgow. The development of the cotton manufacture now became immense. By a happy adaptation of other chemical processes, in conjunction with the bleaching power of chlorine, the time required for the whitening of cotton and linen fabrics was at once reduced from months to hours, while the miles of outstretched calico, defacing the verdure of country districts, disappeared, the whole operation being carried on within the small space of an ordinary factory. You may imagine what an impulse this gave to a trade so important to us. The bleaching of calico now consists of a chemical operation of great precision; that of silk and wool has not yet been so thoroughly comprehended by Science, and consequently has not derived so many advantages from its application.

A greater acquaintance with the theory of bleaching has led to a better understanding of the very ancient practice of washing. The washing of domestic linen is by no means an operation too insignificant for the attention of the Chemist. A dozen shirts may cost 3*l*. 12*s*., this being the united interest of the producer, cotton-spinner, and shirt-maker. These shirts will last three years, with care; and supposing three to be washed each week, the cost of washing—that is, the washerwoman's interest in the dozen shirts—amounts to 7*l*.16*s*., or more than double that of the cotton-spinner. In fact, the cost of washing is about one-twelfth

the income of a family of moderate means. Taking rich and poor together, and estimating the cost of washing at no more than 3*d.* per head weekly, the annual charge of washing to the metropolis alone is 1,535,060*l.*, which is equal to about one-twenty fifth of the whole capital invested in the cotton manufactures of the United Kingdom. Hard water usually contains lime; and in washing that earth unites with the fatty acid of soap, producing an insoluble body of no use as a detergent. For every 100 gallons of Thames water, 30 oz. of soap are thus wasted, before a detergent lather is formed. In personal ablution we economize this excessive waste by the uncomfortable practice, universally followed in London, of taking about an ounce of water into the hands, and converting it into a lather, the water in the basin being only employed to rinse this off, instead of aiding in the detergence. But in washing linen this plan cannot be followed, every particle of the lime being removed before the soap becomes useful; this, as a matter of economy, is frequently accomplished by carbonate of soda, as being cheaper than soap. The amount of soap and soda salt thus wasted in the metropolis has been stated to be equal to the gross water rental. Hard water, besides wasting soap, produces a greater tear and wear of clothes.

All these facts are well known to manufacturers; and hence the care with which a water is selected before the seat of a manufactory is determined. Why, then, should we not attend to our domestic manufactures, considered trifling only because they are carried on with a great division of labour, unseen in its aggregate? Yet these domestic manufactures are of more importance, economically, than those carried on in large and imposing factories.

I wish I had time to refer, with sufficient detail, to the discovery of Mercer, who has shown that the immersion of cotton in soda or in sulphuric acid causes an equal contraction of the fibres, thus producing the mechanical effect of a loom. If a very fine calico, containing as much as 180 picks to the inch, be thus treated, it contracts to calico of 260 picks to the inch—a fineness not yet attained by any mechanical contrivance. This calico, in addition to its acquired fineness, has also assumed powers which enable it to receive colours superior to those assumed by ordinary calico. Before leaving this important discovery of Mercer, I should allude to one other by the same chemist. The French calico-printers employ mousselines-de-laine consisting altogether of wool; while in England we use a much cheaper fabric, consisting of wool and cotton. The colours on this mixture are, however, extremely meagre when compared with the former; but Mercer has shown that the mixed fabric acquires the properties of the other when it is treated with a bath of chloride of lime. This, one of the greatest discoveries ever made in calico-printing, has been of great value to this country.

I cannot, however, allude to all the triumphs of Chemistry in calico-printing, an art which has grown with the growth of Chemistry, and strengthened with its strength. The knowledge of mordants and of colours, and the other results of chemical discoveries, are of every-day occurrence. Let us take one of the last examples. Lapis lazuli, long celebrated for its beautiful blue, almost ranked among the precious stones, and was sold at a price which put it quite out of the reach of the calico-printer. But chemists, ascertaining its composition by analysis, soon learned how to make it by synthesis. Artificial ultramarine is now manufactured at three or four shillings per pound. But when it was made, how was it to be fixed on cloth? From its insolubility its fixation was a real difficulty. Chemists suggested that the ultramarine might be mixed with albumen, which, being coagulated with heat, would retain the colour on the cloth to which it was applied. Whole barrels of the dried white of eggs are now to be seen at calico-print works. Yet this is an expensive process. Could common cheese not be substituted for the white of eggs? Cheese is soluble in ammonia; and the ultramarine, being mixed with this solution, is retained by the cheese, when the ammonia evaporates. Now, therefore, the ultramarine is fastened on by cheese, made from the buttermilk of Scotland, and sold under the name of lactarine.

Stannate of soda is a salt largely used by calico printers. The usual mode of preparing it was, (1), tin was reduced from its ore; (2), this tin was dissolved in muriatic acid; (3), it was oxidized by nitric acid or chlorine; (4), the oxide thus formed was precipitated and redissolved by soda, this bulky, aqueous solution being furnished to calico-printers. Mercer simplified the process, and obtained it in the solid state by two operations: (1), the tin was obtained as before; (2), this tin was fused with a mixture of nitrate of soda and caustic soda, the former oxidizing it, and the latter forming stannate of soda with the oxide thus formed. Young showed in the exhibition a still further simplification. The common ore of tin is an oxide: why then was it necessary to reduce it to the metallic state merely to oxidize it again? He therefore fused the ore at once with soda, the impurities remaining undissolved; and the salt was made by one operation. I quote this instance as a remarkable example of the tendency of Chemistry to simplify processes of manufacture.

I might refer to the important discoveries of yellow and red prussiate of potash, the formers of Prussian blue; but this would only be to cite one out of innumerable appliances. I prefer, therefore, to finish this part of the subject, by alluding to the resists and discharges used in calico-printing. In order to preserve white patterns in the process of dyeing, the nations of the East, whence calico-printing originated, still employ the most laborious mechanical devices, each white spot being covered with sealing-wax, or by being tied up and protected from the dye. By the aid of chemistry, we either discharge the colour on the cloth, or we put upon it bodies which resist the action of the mordants and prevent the colour attaching to that particular part. Acids made from the lees of wine (tartaric acid) and from the lemon (citric acid) are now largely used in these operations, and hence come the beautiful patterns we enjoy in our dresses. It was found that, even when the whites were thus obtained, they became soiled in washing off the excess of mordants from the other parts of the cloth; and the only mode of preventing this was, to treat the cloth with a bath of cowdung. Large dairies were consequently necessary adjuncts of a calico-print work. Chemistry has shown that the action of the manure is due to its phosphates; and a mixture of phosphate of soda, phosphate of lime, and size, is now substituted for the filthy baths formerly indispensable. I could spend hours in discoursing to you on the triumphs of Chemistry in the dyeing of textile fabrics, whether of cotton, wool, and silk, or their mixtures; but I must content myself with these few isolated examples, and pass on to other subjects.

Leather.—The manufacture of leather has been less advanced by the application of Chemical Science than any other of the arts. If Simon, the tanner of Joppa, had been able to send leather to the Exhibition, no doubt he would have carried off a medal for leather as good, and made exactly by the same process, as that of our most eminent manufacturers of the present day. And yet the science of leather production is better understood now than then; but so many physical conditions are involved in the production of good leather, that scientific processes have been unable to satisfy them all. The hides, steeped in an infusion of oak bark, absorb tannin and are converted into leather. Good sole leather takes about a year to tan, and even calf-skins consume a month in the operation. Chemists have certainly indicated substitutes for bark, containing a greater amount of tannin; and these, as for

instance terra japonica, cutch, catechu, and dividivi, produce their effects in half the time, but the leather is said not to be so durable. With sumach light skins may be tanned in twenty-four hours, and with the aid of alum even in one hour; but the resulting manufactures are not preferred to the old processes. Atmospheric and hydrostatic pressure have been used to hasten the absorption; the refined laws of Endosmis and Exosmosis have been called in to accelerate the process; heavy rollers have squeezed the solution through the pores; but all these methods have at the best but a doubtful success. Leather-manufacturers meet men of science by the well-founded assertion that the resulting leather is too porous, too hard or too soft, or not sufficiently durable; and they revert to their old traditional modes of preparation. I allude to these failures the more especially to show that there is a wide chasm between the chemist's laboratory and the workshop,—a chasm which has to be bridged over by the united aid of the philosopher and the manufacturer. One without the other does not suffice; but both, working together, may achieve great results. Yet, in bridging over this chasm, they must act on a common plan. If the manufacturer build his half without understanding the principles of construction employed by the other, the sides of the bridge may indeed meet, but they are not constructed to receive the binding influence of the keystone, and the arch must give way and tumble down.

Having thus shown the comparative failure of Chemistry in revolutionizing this important manufacture, let me take one or two instances from it to prove that, in the details of the working, it has been of use in economizing time and labour, and in affording new uses to comparatively valueless objects. In removing the hair from the hides, previous to tanning, it was customary to shave it with a knife. This process was tedious and imperfect, and the following simple one is now used. Lime-water dissolves the bulbous root of the hair, when the hides are immersed in it for some time, and the hair may then be readily removed by a blunt instrument. By this simple process one man can remove the hair from a hundred kid-skins in an hour. Still the immersion requires several weeks, while the addition of red orpiment to the lime, as practised by the sheep-skin manufacturers of France, reduces the time to a few hours.

When goat-skins are tanned for morocco leather it is necessary, in order to adapt them for dyeing, to remove the lime absorbed by the last operation. A solution of *album græcum* cleanses the pores effectually, leaving them so spongelike that air can readily be forced through them. Hence the process of tanning is rendered much easier. being in fact completed within twenty-four hours; while the leather is rendered fit to assume the colours so characteristic of morocco. About fifty persons are employed in London to collect the sweepings of dog-kennels for this purpose, and many more in applying them; and I am informed, by Mr. Bevington, that the sum annually paid to the collectors and workmen employed in using this apparently worthless substance, is not less than 5000*l*. in the metropolis alone.

The currier shaves leather to render it of equal thickness, and the shavings were treated as waste, scarcely fit for the manure-heap; but Chemistry has shown that they contain much nitrogen, which renders them well adapted for the formation of the beautiful colour known as Prussian blue.

Soap.—Soap is probably not older than the Christian era, for the soap of the Old Testament seems to have been merely alkali. Profane history, previous to Christ, does not allude to soap; and in all the detailed descriptions of the bath and of washing, it is never mentioned. Pliny describes its manufacture, but ascribes to it as singular a use as that given to the potato by Gerard, who, in his "Herbal," assures us that it "is a plant from America, which is an excellent thing for making sweet sauces, and also to be eaten with sops and wines;" so Pliny, in regard to soap states, that its main purpose was to dye the hair yellow, and that men used it for this purpose much more than women. Gradually its use became more extensive, and its manufacture considerable. Soap generally consists of a fatty acid, combined with the alkali soda. This soda was imported from Spain under the name of barilla, itself the ashes of plants grown near the sea. As these plants derived their soda from the sea, near which they flourished, Chemistry—though singularly enough in the person of Napoleon Bonaparte—suggested that it might be artificially made from sea salt. A process for this was perfected, and soda derived from salt has now replaced barilla. From 1829 to 1834 the average annual import of barilla was 252,000 cwt.; it is now almost nothing. But besides this substitution, the cheapness and comparative purity of the soap, and consequently of soda, is enormously increased, and probably exceeds ten times the largest quantity of barilla ever imported in one year into this country. Its cheapness and excellence have also had a prodigious effect on the manufacture of glass.

Chemistry has thus produced great economy and increasing power of production to the manufacturers of soap, by furnishing them with soda prepared directly and artificially from salt, instead of through the organism of plants. This, however, is only one of the benefits conferred on this manufacture by Chemical Science. The fiscal regulations of foreign countries rendered their tallow and fats expensive to British industry. Russia, with almost a monopoly of tallow and linseed oil, thought it good policy to sell them at high prices. But Chemistry pointed out that vegetables, as well as animals, produce similar fats. The fat of beef and mutton exists in cocoa beans; human fat in olive-oil; that of butter in palm-oil; and horse fat and train-oil are in many oily seeds. Was it, then, necessary to submit to the high prices of Russian tallow? Now, palm and cocoa-nut oil largely replace the fat of the Russian oxen and sheep, although the cheap importation of similar fats from Australia and South America has rendered the substitution less necessary.

CORRESPONDENCE.

Natural History Society of Montreal.

We have great pleasure in giving insertion to the accompanying communication from Major Lachlan, vindicating the Natural History Society of Montreal, from imputations which he considers to have been cast upon it by our introductory remarks to this Journal, page 2. That the gallant President misunderstood the tenor of the passage he refers to, will be evident to any one who dispassionately considers it; far from any disrespect being intended by our enquiry, the contrary is expressly stated. His own Address to that Society, in March, 1852, commented in much stronger terms than a stranger would venture to do, upon its "non-success," and on the spirit of indifference which appeared to have fallen upon it. Such a fact in the previous experience of a Canadian Society, was too important to be left out of view, in considering the probable prospects of the Canadian Institute; but we really thought we had alluded to it in terms to which the most sensitive could attach no offence. We are, however, too well aware of the ardent support which the gallant Major has given for many years, to every proposal having in view the development of scientific pursuits in Canada, to be surprised that such an allusion to a society presided over at present by himself, should meet with a warm response: and too well pleased to have the character and condition of our brethren in the Lower Province, placed in a favorable light before our readers, to feel the smallest hesitation in making the fullest *amende* for any thing unjust in our remark. In fact, the expression that neither the Natural History Society of Montreal, or the Literary and Historical Society of Quebec, have practically exercised any influence in Upper Canada, does appear to be somewhat too strong: the former by its prizes and

medals open for competition to all the Provinces; the latter by its valuable historical and scientific publications, has, doubtless, to a limited extent, influenced the cultivation of literary and scientific pursuits in this Province. Honor to whom honor is due. Our remark had reference principally to that practical encouragement which such pursuits can derive from the action of a local body. In conclusion, let not the friends of science and literature in Lower Canada, admit the supposition that any ungenerous spirit of rivalry actuates those who are supporting the same cause here; or that the latter seek to exalt themselves at the expense of the former. A little healthy emulation, will promote perhaps, the life of both parties; but let, at least, the jealousy of Scientific Societies be for Canada, alone—and East and West, combine to promote her good, and bring honor to her name.

To the Editor of the Canadian Journal:

MONTREAL, 31st Dec., 1852.

SIR,—My attention having lately been called to a remark in the introduction to the first number of your Journal, coupled with a paragraph in the more widely circulated valuable Almanac of your Publisher, on the present state of the Natural History Society, I trust I may, as its President, be permitted to occupy a small space in your columns, while I endeavour to vindicate that Association from any prejudicial effects likely to arise from a partial mistake made in the one, and an ungenerous and undeserved insinuation in the other.

In the very appropriate introductory remarks alluded to, you very justly draw public attention to the comparatively little progress as yet made in Canada, in the pursuit and cultivation of the Physical Sciences, and to their having by no means attained that place which might have been looked for at this stage of our history. I regret to be compelled to admit the humiliating fact; but I am not quite satisfied with the manner in which you refer to the only two instances noticed by you: and I am disposed to think that you might have commenced with examples nearer home—it being well known that signal failures have taken place in the good City of Toronto,—where, with a united, and, as it were, homogeneous British population, better things might have been expected. For instance, without going further,—though there are even later instances—you might have named "*The Literary and Philosophical Society of Upper Canada*," attempted to be set on foot, some 21 years ago, under the patronage of Sir John Colborne, for the promotion and study of Natural and Civil History, Natural Philosophy and the Fine Arts, but which fell to the ground in spite of all the efforts of such men as Dr. Dunlop, Mr. Charles Fothergill, Dr. Rees, and others. But you were content to single out the two Societies in *Lower Canada* alone, and without bearing in mind that curse of Canada, "the war of races," which seems doomed to forbid all generous amalgation of *mind* or *matter*, for many years to come, state as follows:—"It is true that two Societies, directed more or less to this object have existed in Lower Canada for more than twenty years, (a circumstance rather creditable to it, be it remembered,) the Literary and Historical Society at Quebec, founded in 1824, and the Natural History Society of Montreal, founded in 1827; but *we have the highest authority for inferring that the latter, at least, has not yet realized the expectations of its zealous founder;* nor can the last report of the authorities of the former be deemed entirely satisfactory. Neither have practically exercised any influence in Upper Canada."

Now, sir, permit me to remark, that though every candid observer must allow that neither of these Associations has come up to the mark which might have been expected, both of them have, in spite of all local obstacles, undoubtedly "exercised some influence" in Canada at large; the one in its Historical Researches, and various interesting Papers connected with the Natural History of the country; and the other in having—besides other important though silent influence,—having indefatigably forced upon the Legislature the valuable Geological Survey of the Province now so successfully in progress under your *Institute's* distinguished President, *Mr. Logan*. Nay, I will even venture to add, in despite of "the high authority" on which you rely that the Natural History Society, with all its short-comings, has in one *main* respect "realized the expectation of its zealous founders," to a very creditable degree, in having accumulated a *Museum* of no mean pretensions, besides a very respectable little Library of about 1,000 volumes; and that I verily believe—and I say so, free from any local bias, being a thorough Upper Canadian—that but for their anxiety to accomplish that object, and the heavy debt unavoidably incurred in the purchase of a mansion suited to such purposes, it might have long ere this borne literary fruits that would not have been discreditable to it; and that, at all events, there is now a spirit of revival among its local members, on whom alone,—unlike your society—the whole pecuniary burthen falls,—which, if well seconded by their numerous corresponding associates, and properly encouraged by the public, will not only *not* "be evanescent," but ere long lead to very satisfactory results.

The paragraph in the Almanac to which I allude, is as follows:—'*Natural History Society of Montreal.*—Established about 25 years ago, for the developement of the Natural History of the Province, and its subsequent application to economic purposes. It is supported by a Legislative grant, and the contributions of members. The late Rev. J. Somerville, bequeathed the handsome sum of £1000 to it, on condition that the interest should be devoted annually to the payment of a series of lectures on some subjects of Natural History. *The Society has pocketed the £1000; but the requirement has not been too exactly fulfilled.* The Society, however, is located in their own building, in Little St. James Street, and presents for examination, a Museum, whether of Zoological, Mineralogical, or Geological specimens, second to few on this continent. The Zoological Department is particularly rich, comprising almost every species met with in this Province. The Society seems lately to have acquired a fresh impetus. We only hope that it may not prove evanescent."

Now, Sir, allow me to observe that there appears an unkindly, if not hostile feeling lurking in part of this observation, which it would have been more creditable to the informant to have checked. I allude to the expression that the Society had pocketed the £1000 left by the late Mr. Somerville, &c., whereas the fact is, that in the express *words* of the will, and not as stated above, the bequeath was made "*towards the founding of a Lectureship on Natural History;*" and that though the money has been temporally borrowed, to pay off part of the debt incurred in the purchase of the commodious mansion now *nominally* owned by the *Society*, but, *in fact*, belonging to the *public*, that was done on the thorough understanding among the members that, until repaid, a course of gratuitous lectures should be annually delivered by them and their friends;—and that this has ever since been the case; and that *I am even disposed to believe that Mr. Scobie's informant was one of the main-promoters of that arrangement.* I may further add, that had Parliament been lately as liberal to the Natural History Society as to various other Institutions in Lower, and even Upper Canada, it would have the sooner been enabled to carry out the Somerville Bequest to the very letter, without attempting to pocket a single farthing of the money.

Cordially wishing the Canadian Institute every possible success in the noble course which it has chalked out for itself,

I remain your obedient servant,

R. LACHLAN.

Editorial Notices.

We have pleasure in acknowledging the receipt of a small box, containing some fragments of limestone, and a small packet of an exceedingly pure and beautiful specimen of burned lime. We have not as yet, received any communication from the donor. The specimen of lime is remarkable for its purity. We should be extremely obliged to the anonymous contributor if he would favour us with the name of the locality where the specimens were procured: at the same time we thank him for his interesting contribution to the museum of limestones which it is the desire of the Council of the Canadian Institute to form and describe.

Mr. Edward Van Cortlandt's notice of an Indian Burying Ground will appear in out next number.

At the weekly meeting of the Canadian Institute, on Saturday, January 8th, it was resolved,—"That it be an instruction to the Council to take steps to bring under the consideration of the Provincial Legislature the intention of the Imperial authorities to withdraw the military detachment in charge of the Toronto Magnetic Observatory; and to suggest the continuance of the observations under Provincial authority." In compliance with the above resolution, the Council of the Institute prepared a draft of a petition to the Governor-General in Council, which was submitted to a very numerously attended meeting of members of the Institute, on Saturday, January 15th, and appproved of.

The attendance of members at the weekly meeting of the Institute, on Saturday, January 15th, was remarkably good, as stated in the preceding notice. A very interesting paper on the "Mineral Springs of Canada" was read by Professor Croft. We hope to have the opportunity of introducing Professor Croft's paper into the February number of this Journal. A considerable number of candidates for admission into the Institute were proposed. Their election will be confirmed on Saturday next. This large weekly increase in the number of members is a very gratifying indication of the progress which the Institute is making in the favour of the public. At the close of the proceedings, the President announced the subject of a paper to be read before the Institute at their next meeting, on Saturday, January 22nd, to be "Notes on the Geology of Toronto," by Professor Hind.

REVIEWS.

The Canadian Agriculturalist, and Transactions of the Board of Agriculture of Upper Canada.—W. McDougall, *Toronto.*

The first annual Report of the Board of Agriculture for Upper Canada is found on the first page of the January number of this very useful publication. The Board recommended a few modifications in the Agricultural Statute passed last Session of Parliament, such as the rendering each County belonging to United Counties "distinct and independent for agricultural purposes under the said act whenever desired." They further suggest that the sum of £17 10s. required to be raised by Township Societies before they can legally organize and receive parliamentary aid, might be advantageously reduced to £10. In relation to an Experimental Farm the Report states as follows :—

"The objects which the Board recommend in establishing an Experimental Farm on the University Ground may be thus briefly stated :—First, to afford the Professor of Agriculture a ready means of giving practical illustration and effect to his class lectures in the University ; Second, to import from abroad new and improved kinds of seeds, plants and implements, chiefly with a view of testing, by experiments carefully conducted on the farm, their adaptation to the climate, soil, wants and markets of this country, and in all cases of a favourable result, to distribute such productions on easy terms throughout the Province. An occasional importation of improved breeds of animals, the offspring being sold and distributed through the Province, would be an efficient means of advancing this very important department of husbandry, and would tend to increase materially the wealth and progress of the country. It is believed that in thus connecting the science and practice of Agriculture in their various bearings on each other, in our Provincial University, it will be made more subservient to the public good.

The Board are desirous that these fifty or sixty acres for experimental and illustrative purposes, should not be mistaken for a Model Farm, which should consist of a larger area, and which would consequently involve a much greater outlay and risk. Whether Model Farms, strictly so called, are adapted to the present wants of this young country, fairly admits of a question. But something should at once be done to connect the leading facts and principles of Agriculture with the routine of instruction given in all the schools and colleges of the Province ; and if small portions of land could be set apart for such purposes, the instruction would prove far more practical and efficient.

The Board will feel much pleasure should the plan of an experimental farm on an inexpensive scale meet the approval of the Legislature, so that they may feel authorized in taking final steps for the carrying out of the same. The principal difficulty lies in the necessary outlay for the commencement. A grant of £500 would enable them to do so with every prospect of success ; and it is believed that the ordinary amount of funds placed at their disposal, would after the necessary preliminary expenditure had been made, nearly or quite meet all exigencies hereafter."

The correspondence of the January number of the Agriculturist is more than usually voluminous. We notice some views of doubtful stability advanced which we do not wish to pass altogether unnoticed. We allude in the present instance to a communication headed 'Agriculture and Coal Fields of Ohio viewed in reference to Canada.' We would suggest a friendly caution to the enterprising writer against causing the indulgence of the expectation that workable coal measures will be found in Upper Canada. We are not disposed to agree with him in the result of his deductions from an experiment with phosphorescent wood, or in the supposition that the same degree of heat necessary to drive off carbonic acid from common lime will 'destroy' the phosphoric acid of phosphate of lime.

The selected articles are very good. One on butter making is well worthy of attentive perusal and study. The Horticultural department contains much useful and interesting matter.

The Genessee Farmer for January, 1853.—Daniel Lee, *Rochester, N. Y.*

The January number of this periodical is well supplied with excellent wood-cuts and useful information. The 'Farm as a Manufactory' is to be discussed in subsequent numbers of the *Farmer*. The subject is one of great interest and importance, and if properly handled will exercise a very beneficial influence.

The writer of 'British and American Agriculture' is rather hard upon English labourers, and scarcely institutes a fair comparison between "a smart well fed Yankee and an English labourer who lives *on nothing but beer*." The Horticultural Department is well sustained, and contains much applicable information and advice.

SCIENTIFIC INTELLIGENCE.

Geology.

Abridgement of a Description of a Brown Coal Deposit in Brandon, Vermont, with an attempt to determine the Geological Age of the principal Hematite Ore Beds in the United States. By Edward Hitchcock, D.D., LL.D., President of Amherst College, and Professor of Geology.—Silliman's Journal.

In the autumn of 1851, Professor Shedd, of Burlington, presented me with a few specimens of beautifully preserved fruits from Brandon, Vermont. They were converted into Brown Coal, and retained exactly their original shape and markings. Early in the spring of 1852 I visited Brandon, and found that the fruits were obtained from a bed of Brown Coal, connected with the white clays and brown hematite of that place. I perceived at once that an interesting field was open before me ; and ever since I have been endeavouring to explore it. Great difficulties presented themselves ; and I have resorted to several gentlemen, both in this country and in Europe, for aid. Their opinion has yet been obtained only in part. But there are several points of much interest to American geology cleared up by what I have already ascertained. I have concluded, therefore, to give a brief account of this case ; hoping hereafter to make additions to it.

I would here acknowledge my deep indebtedness to John Howe, jr., the proprietor of this deposit of iron, clay, and brown coal. Not only did he do all in his power to aid my investigations upon the spot last spring, but since then he has sent me, free of expense, numerous specimens of the fruits and the coal ; especially at one time two barrels of the coal containing the fruits, and at another time a gigantic mass of lignite,—the trunk of a large tree, in fact,—which is now deposited in the cabinet of Amherst College.

I shall first give a description of the topography and geological associations of this carbonaceous deposit ; next an account of the lignites and fossil fruits ; and, finally, deduce from the facts some geological inferences of importance.

I. *Topography and Geological Associations.*

Geologists are aware that along the west base of the Green and Hoosac Mountains, from Canada to New York, occur numerous beds of brown compact and fibrous hematite iron ore. That in Brandon lies between two and three miles east of the village. Passing easterly from the village the surface rises slightly and exhibits clay, drift, and limestone rock in place. According to my measurements with the aneroid barometer, Brandon village is 465 feet above the ocean, and the iron

mine 520 feet above the same. A short distance east of the mine the Green Mountains rise rapidly.

At this spot we find the following varieties of substances in juxtaposition :—

1. Beautiful kaolin and clays coloured yellow by ochre, rose-colour by manganese, (?) and dark by carbon.
2. Brown hematite and yellow ochre.
3. Ores of manganese.
4. Brown coal.
5. Beds of gravel connected with the clays.
6. Drift, overlying the whole.
7. Yellowish limestone, underlying the whole.

The position of the clays it is difficult to determine exactly, as there seems to have been a good deal of disturbance of the strata, perhaps only the result of slides. The iron is generally found beneath the clay, as is also the manganese. The coal in a few places shows itself at the surface. In one spot a shaft has been carried through it, only a few feet below the surface, and the same has been done to the same bed nearly 100 feet below the surface. In both places it is about twenty feet thick. I found it to be the conviction of the miners that this mass of coal forms a square column of that thickness, descending almost perpendicularly into the earth, in the midst of the clay. My own impression was, that it is a portion of an extensive bed, having a dip very large towards the north-west; perhaps separated from other portions of the bed by some disturbance of the strata. But I found great difficulty in tracing out its exact position.

It ought to be mentioned that no unstratified or igneous rocks are known to exist in the vicinity of these deposits; nor do they exhibit any marks of the metamorphic action of heat.

II. *Coal, Lignite, and Fossil Fruits.*

The greater part of the carbon of this deposit is in a condition intermediate between that of peat and biuminous coal. It is of a deep brown colour, and nearly every trace of organic structure, save in the lignite and the fruits, is obliterated. Disseminated through it are numerous angular veins, mostly of white quartz, rarely exceeding a pea in size. It burns with great facility with a moderate draught, and emits a bright yellow flame, but without bituminous odour. After the flame has subsided, the ignited coals consume away, leaving, of course, a quantity of ashes. It is employed to great advantage in driving the steam-engine at the works; and I should think it might be used advantageously for fuel in a region where wood is scarce, which is not the case at Brandon.

Interspersed through the carbonaceous mass above described, occur numerous masses of lignite. In all cases which have fallen under my observation, they are broken portions of the stems or branches of shrubs and trees, varying in size from that of a few lines to a foot and a half in diameter. They all appear to me to have been drift-wood. The largest mass which I have seen, and to which I have already referred as sent me by Mr. Howe, resembles exceedingly a battered piece of flood-wood; which led Mr. Howe humourously to inscribe upon the box in which it was sent, "*A piece of flood-wood from Noah's Ark.*"

This lignite in all cases retains and exhibits upon a fresh fracture its organic structure; yet generally it is quite brittle, and when broken across the fibres it has the aspect of very compact coal, which admits of a good polish. In some specimens the original toughness of the wood is not quite lost, and the aspect of the wood remains.

The large mass of which I have already spoken as now in the cabinet of Amherst College, is four feet long and sixteen inches in its largest diameter. It is considerably flattened, but seems to have been so originally. In the peaty matter that adheres to it I noticed several specimens of fruit, and more than one species.

With perhaps one or two exceptions, all the lignite of this deposit belongs to the exogenous or dicotyledonous class of plants. In general the texture is close, and some of the wood is very fine-grained and heavy. The bark is often quite distinct. I have been inclined to refer some of the wood to the maple; yet probably a good deal of it is coniferous; but my microscope examinations on this point have not been as satisfactory as I could wish. I do not think much of the wood belongs to the pine tribe now common to this latitude. I have placed specimens in the hands of several distinguished vegetable physiologists, and had hoped ere this to learn their opinion; but they have not yet given it.

The only other fossil fruits that I have known to be found in our country are a few from the tertiary strata at Richmond, Va. In respect to these, Professor Jeffries Wyman has kindly furnished me with the following description :—

"In my examinations at Richmond I have frequently found lignite, occasionally fruits; but as I was more anxious for bones, I gave them but little attention. I have identified a species of Carya (walnut), which was so pronounced by Mr. Teschemacher, Prof. Agassiz, and Dr. Gray. I have also found one species of pine cone, in company with pine lignite. The latter was interesting, as having changed, while lying on my table, from the condition of rotten wood, soft enough to yield to the tip of the finger, into lignite of the usual hardness, and having the coal-like fracture. This, however, is no uncommon occurrence, and is said to be well known to geologists. The piece of wood just referred to had been bored by the teredo. The above are the only instances about which I would speak with any confidence. I have, also, from the same locality, a large mass of fossil resin. The vegetable fossils there found, with the teeth of Phyllodus, Cetacea, reptiles, sharks, &c., show a close resemblance of the Richmond formations to the London clay. I have in preparation a short notice in which the animal fossils of the two are to be compared.

CONCLUSIONS.

Although the specific character of the Brandon fossils are thus imperfectly known, the facts detailed will warrant several inferences of importance in American geology.

I. *The Brandon deposit belongs to a tertiary formation.* The following are the proofs :—

1. It lies below the drift, and for the most part is not consolidated. Its position as to the drift is seen at the openings made near the carbonaceous deposit; and the degree of induration,—or rather, in general, the want of induration,—corresponds to that of most tertiary deposits.

2. It contains all the important varieties of rock found in tertiary deposits. We have here white and variegated clays, water-worn beds of sand and gravel, beds of carbonaceous matter not bituminous, and deposits of iron and manganese.

II. *The carbonaceous matter in this deposit is strikingly analogous to that of the brown coal formation in Europe.*

1. The lignite has the deep brown colour and coal-like fracture of the brown coal deposits that have not been affected by the proximity of igneous rocks, as is the case at Meisner in Hesse. Yet the woody texture usually remains distinct.

2. While this coal is distinguished from peat by burning with a bright flame, it does not give off a bituminous odour, and thus it differs from bituminous coal.

3. The degree of carbonization of the fruits corresponds to that in the brown coal formation, as a comparison of specimens shows.

4. The sand and clays, associated with the brown coal of the Rhine valley, occur also at Brandon.

III. *The fruits and lignite of this deposit appear to have been transported by water, and probably the accumulation took place in an ancient estuary.*

1. No example has occurred in which these fruits have been found in clusters, or attached to the branches on which they grew or to their envelops; nor have I found more than a single imperfect example of a leaf.

2. The lignite is in broken and usually bruised masses, as if battered by contact with one another when floating down stream.

3. The numerous places in other parts of the United States where an analogous deposit occurs, as will be shown below, render it probable that this was formed in an ocean rather than a lake.

IV. *The Brandon deposit is the type of a tertiary formation hitherto unrecognized as such, extending from Canada to Alabama.*

This formation is identified by the following characters :—

1. The most prominent and well-known substance in this formation, on account of its economical importance, is brown hematite. In the geological surveys of Vermont, Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, and North and South Carolina, this ore is described by Adams, Shepard, Percival, Mather, Henry D. and William R. Rogers, Olmsted, and Tuomey. Throughout this whole distance of 2000 miles, there is a striking resemblance in the character of the ore. It is compact, fibrous, and stalactitical; and much of it is in a state of ochre.

2. It is always more or less enveloped in clay of various colours.

3. It is almost invariably found lying upon or near a certain sort of limestone, or its associated and interstratified mica slate. This limestone is usually highly crystalline, and when disintegrated it shows a large proportion of iron in its composition; and the general opinion of the geologist just named is, that the iron originated from it. Indeed, Prof. Adams, in his first report on the Vermont survey, has described a true vein of iron ochre in the limestone, which I have also examined. I have

likewise some reason to suppose that Foss's bed of hematite in Dover, N.Y., may once have constituted a bed in mica slate.

In all the Northern States, the beds of this ore occur along the western base of high mountains; and from the description of the gentleman above named I understand this to be the case in the middle and Southern States. Prof. Henry D. Rogers imputes this fact to the southern direction of the currents in the great ocean by whose waters the iron and the clay were deposited, and to the greater depression of the valley on its south-eastern side. Prof. Rogers is the only geologist I believe who speaks decidedly of the deposition of this ore from the ocean. By this supposition he comes so near representing this formation as tertiary, that it would have needed only a bed of carbonaceous matter, such as occurs at Brandon, to have brought him upon that ground. Not improbably, now that the Brandon bed is known, similar ones may be found associated with the ore of other localities: for how long has it remained unnoticed at Brandon!

Thus does the discovery of the Brandon brown coal deposit enable us to add to American geology a tertiary formation nearly 1200 miles long, which may appropriately be placed upon our maps.

V. *This deposit probably belongs to the Pliocene, or Newer Tertiary.*

1. So far as we know, it lies immediately beneath the drift.

2. It is destitute of any consolidated beds, save the nodules of hematite, which is not true of any of our miocene or eocene deposits.

3. The brown coal of continental Europe, to which ours corresponds closely in appearance, belongs to the newer tertiary.

I confess that these arguments are not sufficient to remove all doubts from my mind as to the part of the tertiary group to which this formation should be referred. All geologists, however, I think, will say that it has marked peculiarities, which distinguish it from all the tertiary deposits of our country hitherto described; and we may at least say, that the presumption is strongly in favour of its being pliocene. It is rather remarkable, if it was an oceanic deposit, that no marine remains have been found in it. I believe, however, that this is very much the case in Germany; though, unfortunately, the papers of Horner, Von Dechan, and others, on the brown coal are not within my reach.

Photographic Landscapes on Paper.

32, Harley Street, Dec. 7.

Allow me to request your insertion in the *Athenæum* of the annexed communication, on the subject of Photography, in the form of a letter to myself from my brother-in-law, Mr. John Stewart, resident at Pau; who has been singularly successful in his application of that art to the depiction of natural scenery,—and whose representations of the superb combinations of rock, mountain, forest and water which abound in the picturesque region of the Pyrenees, are among the most exquisite in their finish, and artistic in their general effect, of any specimens of that art which I have yet seen. The extreme simplicity of the process employed by him for the preparation of the paper, its uniformity, and the certainty attained in the production of its results, seem to render it well worthy of being generally known to travellers. It need hardly be mentioned that the "air-pump" employed may be one of so simple a construction as to add very little to either the weight, bulk, or expense of the apparatus required for the practice of this art. The obtaining of a *very perfect* vacuum, for the imbibition of the paper, being a matter of little moment,—a single barrel (worked by a cross-handle by direct pull and push,) furnished with a flexible connecting pipe, and constructed so as to be capable of being clamped on the edge of a table, would satisfy every condition.

I remain, &c., J. F. W. HERSCHEL.

Pau, Pyrenees.

My Dear Herschel,—Thanks to the valuable indications of Prof. Regnault, of the *Institut*, I have been enabled to produce, what appear to me, most satisfactory results in *Photographic Landscapes on Paper.* In this remote corner (so deficient also in resources for experiment) I feel that I am but very partially acquainted with the results obtained and the progress making in the great centres, Paris and London; but I think that, in detailing the simple process and manipulation I now adopt, indications of some value, and suggestive of further improvement to fellow-labourers in the art may be found; and if you are of the same opinion, you will perhaps facilitate the communication of these details to our photographers at home.

The following observations are confined to negative paper processes, divisible into two—the *wet* and the *dry*. The solutions I employ for both these processes are identical, and are as follows:—

Solution of Iodide of Potassium, of the strength of 5 parts of iodide to 100 of pure water.

Solution of Aceto-Nitrate of Silver, in the following proportions: 15 parts of nitrate of silver; 20 glacial acetic acid; 150 of distilled water.

Solution of Gallic Acid, for developing, a saturated solution.

Solution of Hyposulphite of Soda; of the strength of 1 part hypo. of soda, to from 6 to 8 parts water.

The solutions employed are thus reduced to their simplest possible expression, for it will be observed that in iodizing I employ neither rice-water, sugar of milk, fluorine, cyanogen, nor free iodine, &c., &c.; but a simple solution of iodide of potassium (the *strength* of this solution is a question of considerable importance, not yet, I think, sufficiently investigated.)

For both the wet and the dry processes I iodize my paper as follows:—In a tray containing the above solution I plunge, one by one, as many sheets of paper (twenty, thirty, fifty, &c.,) as are likely to be required for some time. This is done in two or three minutes. I then roll up loosely the whole bundle of sheets, while in the bath; and picking up the roll by the ends, drop it into a cylindrical glass vessel with a foot to it, and pour the solution therein, enough to cover the roll completely (in case it should float up above the surface of the solution, a little piece of glass may be pushed down to rest across the roll of paper and prevent its rising.) The vessel with the roll of paper is placed under the receiver of an air pump and the air exhausted; this is accomplished in a very few minutes, and the paper may then be left five or six minutes in the vacuum. Should the glass be too high (the paper being in large sheets) to be inserted under a pneumatic pump receiver, a stiff lid lined with India rubber, with a valve in the centre communicating by a tube with a common direct-action air-pump may be employed with equal success. After the paper is thus soaked *in vacuo* it is removed, and the roll dropped back into the tray with the solution, and then sheet by sheet picked off and hung up to dry, when, as with all other iodized paper, it will keep for an indefinite time.

I cannot say that I fully understand the rationale of the action of the air-pump, but several valuable advantages are obtained by its use:—1st. The paper is thoroughly iodized, and with an *equality* throughout that no amount of soaking procures, for no two sheets of paper are alike, or even one, perfect throughout in texture; and air bulbs are impossible. 2nd. The operation is accomplished in a quarter of an hour, which generally employs one, two, or more hours. 3rd. To this do I chiefly attribute the fact that my paper is never solarized even in the brightest sun; and that it will bear whatever amount of exposure is necessary for the deepest and most impenetrable shadows in the view, without injury to the bright lights.

Wet Process.—To begin with the *wet* process. Having prepared the above solution of aceto-nitrate of silver, float a sheet of the iodized paper upon the surface of this sensitive bath, leaving it there for about ten minutes. During this interval, having placed the glass or slate of your slider quite level, dip a sheet of *thick* clean white printing (unsized) paper in water, and lay it on the glass or slate as a wet lining to receive the sensitive sheet. An expert manipulator may then, removing the sensitive sheet from the bath, extend it [sensitive side uppermost] on this wet paper lining, without allowing any air globules to intervene. But it is difficult, and a very simple and most effectual mode of avoiding air globules, particularly in handling very large sheets, is as follows:—Pour a thin layer of water [just sufficient not to flow over the sides] upon the lining paper, after you have extended it on your glass or slate, and then lay down your sensitive paper gently and by degrees, and floating as it were on this layer of water; and when extended, taking the glass and papers between the finger and thumb, by an upper corner, to prevent their slipping, tilt it gently to allow the interposed water to flow off by the bottom, which will leave the two sheets of paper adhering perfectly and closely, without the slightest chance of air-bubbles:—it may then be left for a minute or two, standing upright in the same position, to allow every drop of water to escape; so that when laid flat again or placed in the slider none may return back and stain the paper. Of course, the sensitive side of the sheet is thus left exposed to the uninterrupted action of the lens, no protecting plate of glass being interposed,—and even in this dry and warm climate I find the humidity and the attendant sensitiveness fully preserved for a couple of hours.

To develope views thus taken, the ordinary saturated solution of gallic acid is employed, never requiring the addition of nitrate of silver; thus preserving the perfect purity and varied modulation of the tints. The fixing is accomplished as usual with hyposulphite of soda, and the negative finally waxed.

Dry Process.—In preparing sheets for use when *dry* for travelling, &c., I have discarded the use of *previously waxed* paper,—thus getting rid of a troublesome operation,—and proceed as follows: Taking a sheet of my iodized paper, in place of floating it (as for the wet process) on

the sensitive bath, I plunge it fairly into the bath, where it is left to soak for five or six minutes; then removing it wash it for about twenty minutes in a bath, or even two, of distilled water, to remove the excess of nitrate of silver; and then hang it up to dry (in lieu of drying it with blotting paper). Paper thus prepared possesses a greater degree of sensitiveness than waxed paper; and preserves its sensitiveness, not so long as waxed paper, but sufficiently long for all practical purposes, say thirty hours, and even more. The English manufactured paper is far superior for this purpose to the French. To develope these views, a few drops of the solution of nitrate of silver are required in the gallic acid bath. They are then finally fixed and waxed as usual.

These processes appear to me to be reduced to nearly as great a degree of simplicity as possible. I am never troubled with stains or spots, and there is a regularity and certainty in the results that are very satisfactory. You will have observed, too, how perfectly the aerial perspective and gradation of tints are preserved, as also how well the deepest shadows are penetrated and developed, speaking, in fact, as they do, to the eye itself in nature. In exposing for landscape, I throw aside all consideration of the bright lights, and limit the time with reference entirely to the dark and feebly-lighted parts of the view. With a $3\frac{1}{4}$-inch lens the time of exposure has thus varied from ten minutes to an hour and a half, and the action appears to me never to have ceased.

The influence of the air-pump in this appears to me very sensible, and deserving of further examination and extension. I purpose not only iodizing, but rendering the paper sensitive with the action of the air-pump, by perhaps suspending the sheet after immersion in the nitrate bath under the receiver of the air-pump for a few minutes before exposure in the camera, or by some other manœuvre having the same object in view.

I should add, that I have chiefly employed Canson's French paper in iodizing with the aid of the pump. Few of the English manufactured papers are sufficiently tenacious in their sizing to resist the action of the pump, but they may easily be made so; and were, in short, the English paper, so far superior in quality to the French, only better sized,—that is with glue less easily soluble, even though more *impure*, there is scarcely any limit to the beauty of the views that might be produced.

There are more minor details that might be given; but I fear repeating many a "twice-told tale," acquainted so little as I am with what is doing: the preceding, however, may have some interest, and whatever is of value is entirely due to our friend M. Regnault, ever so generously ready as well as able to aid and encourage one's efforts.

Ever yours, JOHN STEWART.

Chemistry and Physics.

1. *On the motion of Fluids from the Positive to the Negative Pole of the closed Galvanic Circuit.*—Wiedemann has communicated to the Prussian Academy of Sciences, a memoir on the mechanical action of the voltaic circuit which is of essential interest and importance. The apparatus employed consisted of a porous earthenware cell, closed at the bottom and terminated above by a glass bell firmly cemented to the upper edge of the cylinder. Into the tubulure of the bell a vertical glass tube was fitted, from which a horizontal tube proceeded so as to permit the fluid raised to flow over into an appropriately placed vessel. A wire serving as the negative pole of a battery passed down through the glass bell into the interior of the porous cylinder, where it terminated in a plate of platinum or copper. Outside the porous cylinder another plate of platinum was placed and connected with the positive pole of the battery. The whole stood in a large glass vessel, which, as well as the interior porous cylinder, was filled with water. The intensity of the current was measured by a galvanometer. As soon as the circuit was closed, the liquid rose in the porous cylinder and flowed out from the horizontal tube into a weighed vessel. The results obtained by means of this apparatus were as follows:—

(1.) The quantity of fluid which flows out in equal times is directly proportional to the intensity of the current.

(2.) Under otherwise equal conditions, the quantities of fluid flowing out are independent of the magnitude of the conducting porous surface.

To avoid any uncertainty arising from the laws of the flow of liquids through small orifices, Wiedemann measured the intensity of the mechanical action of the current by determining the height of a column of mercury which would hold the transferring force in equilibrium. For this purpose a graduated tube or manometer filled with mercury was attached to the extremity of the horizontal tube above mentioned: with different currents and porous surfaces of different extent, the mercury in the manometer rose to different heights. By the measurements of these heights the following results were obtained:—

(3.) The height to which a galvanic current causes a fluid to rise, is directly proportional to the intensity of the current and inversely proportional to the extent of the free porous surface.

The mechanical action of a galvanic current may also be referred to its simplest principles by the following proposition:—

(4.) The force with which an electric tension, present upon both sides of a section of any given fluid, urges the fluid from the positive to the negative side, is equivalent to a hydrostatic pressure which is directly proportional to that tension.

In this manner therefore we obtain a simple measure of electric tension and its mechanical action in terms of atmospheric pressure and consequently of gravity.

The above laws hold good only for fluids of the same nature. When different fluids are subjected to the action of the currents, the mechanical action is greatest upon those which oppose the greatest resistance to its passage. The requisite data are still wanting to determine the precise connection between the mechanical action and the resistance, but observations made with solutions of sulphate of copper of different degrees of concentration, appear to show that the quantities of fluid transferred in equal times by currents of equal intensity, are nearly proportional to the squares of the resistances.—*Monatsbericht der K. P. Akademie der Wissenschaften, March,* 1852, 151.

Spots on the Sun.—The number of spots seen in 1826 was 118; from this there was an increase to 161 in 1827 and 225 in 1828, and then a decrease to 33 in 1833. The number again increased, and was 333 in 1837, 282 in 1838, and 34 in 1843. Again it increased and after five years in 1848, it was 330, since which there has again been a decrease. Moreover at the time of minimum the spots are much smaller than at the maximum. In 1844 the largest was hardly 4′ broad. While in 1848 three groups were $8\frac{1}{2}$′ across, and one spot appeared for seven or eight consecutive rotations.

M. Gautier observes that he has remarked a singular connection between this decennial period in the spots, and a decennial period in the variations of the magnetic needle recently pointed out by Dr. Lamont of Munich. According to this astronomer, since August, 1840, the mean annual amplitude of the diurnal variation of magnetic declination between 8 A. M. and 1 P. M. augments regularly for *five* years and then diminishes for five years. The epoch of the *minimum* of this amplitude corresponds to the middle of the year 1843, and that of the *maximum* to the middle of 1848. He has also found, from the Gottingen observations a *maximum* in 1837, corresponding with the above observations on the spots.

The results of Dr. Lamont have been confirmed by M. Reslhuber at the Observatory of Kremsmunster in Austria. Thus in 1843, the annual mean diurnal variations of declination and intensity have been respectively 6′ 28″·6 and + 0·00088; and in 1844 they were 6′ 14″·9 and + 0·00138. In 1848, they were 10′ 55″·4 and + 0·00273; in 1849, 10′ 39″.5 and and 0·00230.

M. Schwabe has deduced from eight observations with regard to the period of rotation of the sun, 25·07 days as the shortest, 25,75 as the longest: the mean of his results gives 25·507. He remarks that some of the spots have a brownish red colour; one was examined with glasses of different colours, to avoid any source of error, its north side was reddish-brown, more red than brown. The next day it had much changed and the border had the usual gray colour.

M. Rodolphe Wolf, of Berne, has been registering the spots since 1847; and he concludes that the number through a year so varies, that if a curve be drawn to express the variation, this curve has undulations, the more regular of which correspond each to a period of about $27\frac{1}{3}$ days, or the period of the sun's rotation with relation to the earth. As bearing on this subject, the author states that M. Buijs Ballot of Utrecht, has concluded from thermometric observations at Harlem, Zwanenbourg and Dantzig, (see Pogg. Ann., 1851, Dec.,) that during a number of years, at each period of 27·7 days there is at these places a small elevation of temperature and at the intermediate period a diminution.

On the Freezing of Vegetables.—In connection with an abstract of Prof. J. LeConte's paper On the Freezing of Vegetables, (Silliman's Journal, vol. xiii., 84,) published in the Bibliothèque Universelle for June, 1852, the following note is inserted by M. A. de Candolle, showing that the action of freezing on vegetation for some years has not been altogether misunderstood by botanists. "In 1838, I published in the Bulletin de la Classe d'Agriculture de Genève (No. 121, p. 171,) in an article on the intense cold of January, 1838, the following remarks—after first alluding to the observations of Pictet and Maurice who found the temperature of the centre of a chesnut tree below zero, and also the experiments of M. Ch. Coindet, who after a prolonged cold had extracted from the middle of a large tree, small crystals of ice:—'These trees are however not dead. I have myself, after a cold but little intense, seen crystals of ice in the interior of the buds of several trees which have not suffered from it. Young branches, the buds of many trees, and the leaves of the plants of our country are in winter often penetrated beyond doubt with a cold several degrees below zero (centigrade); and although the viscous liquids of the slender tubes congeal with difficulty, it must frequently happen that congelation

takes place, without the plant or the organ perishing. Thus cold does not kill vegetation by a mechanical action proceeding from the congelation of the liquid as some naturalists pretend. We must recognize rather a physiological action; that the vitality of the tissue is destroyed by a certain degree of cold followed by a certain degree of heat, according to the peculiar nature of each plant. The vegetable and animal kingdom, according to this view, will act alike. In the same manner as the gangrene that sets in after the thawing of a frozen part causes the death of an animal tissue, so the change or putrefaction which follows a rapid thawing will be the principal cause of the death of the vegetable tissue. Is is well known in practice how to manage the transitions of temperature to preserve the organs of vegetables.'

Since 1838, until my connection with the Academy of Geneva ceased, I stated in my annual lectures that cold may act in two ways on vegetation:—either *physically*, by the contraction or congelation of the liquids, which often does not kill them; and *physiologically*, by an action upon the tissues and upon vegetable life, which the laws of physics do not account for. The most striking example of this last, is the immediate death of hot-house plants when exposed to a temperature of 1 + or + 2° C., which causes no congelation. The action of the same degree of temperature is very different on two allied species, and sometimes on two varieties of the same species."

Shooting Stars.—M. Coulvier Gravier reports (*Comptes Rendus Acad. Sci.*, Aug. 16, 1852) that according to his observations at Paris from June 18 to Aug. 13, 1852, the average hourly number of shooting stars seen (by one observer ?) at midnight was in the first half of July about 8, from the 16th to the 21st, 11; from the 22d to 27th, 21; from Aug. 2d to 6th, 38; on the 10th, 63; on the 11th, 50; on the 12th and 13th, 45.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—December, 1852.

Latitude 43 *deg.* 39.4 *min. North. Longitude*, 79 *deg.* 21 *min. West. Elevation above Lake Ontario:* 108 *feet.*

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch.	S'nw in Inch.
						°	°															
c	1	29.967	29.953	29.924	29. 949	31.6	42 4	33.4	35.50	0.147	0.187	0.157	0.167	82	70	82	80	S W b W	S b W	S W b S	- -	- -
bd	2	.957	.943	.908	. 933	28 4	44 6	32.7	34 78	.139	.205	.154	.167	89	71	82	83	S W b S	S S W	N E b E	- -	- -
c	3	.812	.713	.596	. 696	33 3	44.6	44.9	40 57	.169	.217	.264	.215	89	75	90	85	N N E	N E b E	E N E	1.020	- -
b	4	.379	.298	.312	. 336	42.4	44.1	37.3	41.02	.214	.265	.210	.237	91	93	95	93	E b N	E N E	N b E	0.060	- -
c	5	.397	.445			40 8	43.7			.236	.244			94	87			W N W	W b S	W S W	Inap	- -
c	6	.529	.355	.326	. 404	40.6	43.7	47.4	43.57	.238	.256	.290	.256	95	91	90	92	S b E	E b S	S S W	Inap	- -
c	7	.369	.126	.004	. 165	45.6	51 0	47.0	47.65	.274	.341	.281	.296	90	93	88	90	S W b S	E N E	S S E	0.460	- -
c	8	.271	.457	.567	. 450	39.9	40 5	37.1	38.92	.228	.159	.158	.179	93	63	71	75	S W	W S W	S W b W	- -	- -
be	9	.499	.384	.460	. 457	37.8	39 6	34.1	36.55	.189	.186	.169	.179	84	77	86	83	E N E	E S E	E S E	- -	- -
	10	591	.577	.579	. 577	27.8	41.3	32.7	33 55	.135	.179	.161	.153	88	70	87	80	S W b W	S W b W	Calm	- -	- -
	11	.480	.388	.466	. 449	31.9	37.0	31.6	33.33	.160	.159	.124	.144	90	72	70	76	N	N b W	W	- -	- -
	12	.579	.640			26.2	34.4			.126	.131			87	65			W b N	W S W	S W b W	- -	0.1
cd	13	.590	.599	.802	. 674	26 6	31.9	26.3	28.35	.118	.164	.108	.132	80	92	75	83	W	N	N W b W	- -	0.5
c	14	.986	30 010	.958	. 986	21.1	31.5	30.9	27.43	.105	.172	.137	.125	89	97	79	81	N W b N	S b E	S E b E	- -	- -
b	15	.974	30.050	30.034	30. 024	23 7	33.4	26 2	27.47	.107	.150	.120	.126	81	80	83	82	S	S b W	S b W	- -	- -
a	16	.928	29.605	29 249	29. 555	34.5	34.4	38 4	36.07	.161	.173	.208	.186	80	88	91	88	E b S	E S E	E b S	0.745	0.2
c	17	.019	29.096	.218	. 123	38.4	30 2	17.2	27.43	.204	.145	.092	.134	88	85	92	85	S W	W S W	W S W	- -	0 5
c	18	.282	.479	.744	. 537	20 8	28.8	26.9	25.95	.093	.106	.105	.107	81	67	71	75	W S W	W	W b N	- -	Inap
b	19	.652	.224			24.4	34 5			.113	.172			84	86			W S W	S W b W	W b S	- -	- -
b	20	.342	.470	.580	. 471	32 8	28.7	18.6	25 57	.124	.118	.088	.109	67	74	83	78	N W	N N W	N	- -	0.3
c	21	.728	.886	.994	. 882	14.0	18.5	17 9	16.72	.078	.063	.076	.074	89	59	74	76	N b W	N N W	Calm.	- -	- -
a	22	30.112	30 188	30.187	30. 168	20 5	26.2	26.9	24.17	.086	.081	.099	.089	75	55	66	67	Calm	S W b S	S E	- -	- -
cd	23	29.900	29.564	29 495	29. 633	29.1	33.3	35.9	33.00	.147	.135	.197	.178	92	98	94	95	E S E	E S E	E	0.600	Inap
c	24	.270	.215	.456	. 347	40.2	43.7	36.6	39 00	.224	.232	.175	.204	91	83	81	86	N E b N	W b S	W S W	0.010	- -
cd	25	.656	.692	.408	. 584	31.6	31.7	33.0	32.33	.149	.148	.166	.157	84	83	88	86	N W b W	Calm.	E b S	- -	6.5
a	26	.448	.611			26 6	29.4			.123	.122			83	75			N W b N	W S W	W S W	- -	- -
c	27	.930	.564	.220	. 543	20.8	33.1	35.5	30.83	.097	.148	.199	.153	93	78	93	88	N W	E b S	E b S	1.100	1.0
e	28	28.966	29.190	29 567	29. 276	39.7	30.2	28.7	32.02	.234	.117	.113	.149	97	70	71	79	S b E	W S W	W b S	- -	Inap
ec	29	29 676	.750	.817	. 757	26.9	28.4	26.9	27.28	.109	.127	.125	.122	74	80	85	81	S W	W b S	W S W	- -	0 5
a	30	.685	.584	.670	. 641	27.3	33.1	26.4	28.73	.119	.171	.130	.134	79	91	88	83	W S W	S b W	E N E	Inap	2.0
a	31	.682	.498	.421	. 519	25.2	23.4	22 6	23.42	.125	.122	.112	.119	91	94	89	92	N E b E	N E b E	N b E	- -	8.0
	M	29.614	29 579	29.591	29 5978	30.83	35.16	31 60	32 27	0.156	0.170	0.156	0.15	86	80	83	83	Ml's 5 60	Ml's 8.10	Ml's 6 47	3 995	20 1

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1096.30	2228.30	1370.34	1516.54

Mean velocity of the wind - - - 6.54 miles per hour.
Maximum velocity - - - - - 21.3 ml's per h'r, from 1 to 2 p m. on 28th.
Most windy day - - - - - 17th: Mean velocity, 14.14 miles per hour.
Least windy day - - - - - 10th: Mean velocity, 2.77 ditto.
Most windy hour - - - - - noon: Mean velocity, 8.37 ditto.
Least windy hour - - - - - 9 p.m. Mean velocity, 5.26 ditto.
Mean diurnal variation - - - 3 11 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

This is the mildest December since 1831, (the earliest date of observations at Toronto.)

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 30.210, at 4 P. M., on 22d } Monthly range:
Lowest Barometer - - 28.966, at 6 A.M., on 28th } 1.244 inches.

Highest observed Temp. - 51.0, at 2 P. M., on 7th } Monthly range:
Lowest regist'd Temp. - 13.2, at A.M., on 21st } 37.8
Mean Highest observed Temperature - - 36.54 } Mean daily range:
Mean Registered Minimum - - - - - - 26.58 } 9.96
Greatest daily range - - - - - 22.2 from 6 A.M., to 10 P.M., on 17th.
Warmest day - - 7th - - - Mean Temperature - 47.65 } Difference:
Coldest day - - - 21st - - - Mean Temperature - 16.72 } 30.93

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for December.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity.
	°	°	— °	°					
1840	24 28	41 0	4 4	45 4	3	inapp.	18	not regis'd	Miles.
1841	29 67	45.5	2. 4	43 1	7	6 600	5		--
1842	25 33	40.3	3. 8	36 5	3	0.880	17		--
1843	30 59	41.1	2. 7	38.4	6	1.040	8	8.1	--
1844	28.78	48.9	— 0. 8	49 7	6	imperfect	6	4 2	--
1845	21.49	37 6	— 2. 7	40.3	2	inapp.	12	4 7	--
1846	27.72	49 2	3. 7	45·5	5	1.215	9	6 0	--
1847	30·58	50.0	6· 6	43.4	7	1.185	8	6.8	4.55
1848	29 63	49.1	0. 6	48.5	7	2.750	7	16 5	5.44
1849	26.92	41.3	— 9. 7	46.5	5	0 840	12	9.6	6.23
1850	22 55	48.3	— 5. 2	58.0	2	0 190	18	29 5	7.40
1851	21 59	43 8	—10. 5	54.3	6	1.073	15	10 7	7.37
1852	32.27	51.0	13. 9	37.1	7	3.995	10	20 1	6.54
M'n	27 03	45.16	0.03	45.13	5.1	1.648	11.2	11.6	6.25

Notice of a Binocular Microscope.

BY J. L. RIDDELL.*

I devised last year, and have lately constructed and used, a combination of glass prisms, to render both eyes simultaneously serviceable in microscopic observation.

Behind the objective, and as near thereto as practicable, the light is equally divided, and bent at right angles, and made to travel in opposite directions, by means of two rectangular prisms, which are in contact by their edges somewhat ground away. The reflected rays are received at a proper distance for binocular vision upon two other rectangular prisms, and again bent at right angles; being thus either completely inverted, for an inverted microscope; or restored to their first direction for the direct microscope. These outer prisms may be cemented to the inner by Canada balsam, or left free to admit of adjustment to suit different observers. Prisms of other form, with due arrangement, may be substituted.

I find the method is applicable with equal advantage to every grade of good lens, from Spencer's best sixteenth to a common three inch magnifier, with or without oculars or erecting eye-pieces, and with a great enhancement of penetrating and defining power. It gives the observer perfectly correct views in length, breadth, and *depth*, whatever power he may employ. Objects are seen holding their true relative positions and wearing their real shapes. A curious exception must be made. In viewing opake solid bodies, with one piece to each eye, depression appears as elevation, and elevation as depression, forming a singular illusion. For instance, a metal spherule appears as a glass ball silvered on the under side; and a crystal of galena, like an empty box. By the additional use of erecting eye-pieces, the images all become normal and natural. Match drawings of any solid object, made from each eye-piece, by the aid of the camera lucida, when properly placed in the common stereoscope, appear to stand out in natural relief. These, if engraved and printed in the proper position with respect to each other, might find an appropriate place in books on the arts and sciences.

In constructing binocular eye-glasses, I use for lightness and economy four pieces of common looking-glass instead of prisms.

With these instruments the microscopic dissecting-knife can be exactly guided. The watchmaker and artist can work under the binocular eye-glass with certainty and satisfaction. In looking at microscopic animal tissues, the single eye may perhaps behold a confused amorphous or nebulous mass, which the pair of eyes instantly shapes into delicate superimposed membranes, with intervening spaces, the thickness of which can be correctly estimated. Blood corpuscles, usually seen as flat disks, loom out as oblate spheroids. In brief, the whole microscopic world, as thus displayed, acquires a tenfold greater interest, in every phase exhibiting, in a new light, beauty and symmetry indescribable.

MISCELLANEOUS INTELLIGENCE.

Ontario, Simcoe, and Huron Union Railroad.

The Directors of the Ontario, Simcoe, and Huron Railroad, accompanied by the Chief Engineer, made an excursion over the road on the 5th instant. So much has been said disadvantageous to the character of this road, that we have much satisfaction in being enabled to state that the road is in excellent order, and that the distance of thirty miles now completed, going northward, was run in one hour; and that on a portion of the road a speed of forty-five miles per hour was attained.

In the vicinity of Newmarket the Directors inspected some heavy works now in progress, and which have been undertaken with a view to the reduction of some objectionable curves made in the original location. When these works are completed,—as they will be early in April,—the grading and bridging will be completed to Barrie; and as the timber for the superstructure is distributed over the line, the laying of the track will then be rapidly proceeded with; and it is expected the road will be opened as far as Barrie early in June.

OBITUARY.

Died, November 11th, at the age of about, 63 or 64 Gideon Algernon Mantell, L.L.D., F.R.S. The renowned geologist, Dr. Mantell, imbibed at an early period of his life a taste for natural history pursuits, and having fixed his residence, as a medical practitioner, at Lewes, was led to devote himself with great natural enthusiasm to the investigation of the fossils of the Chalk and of the Wealden of Sussex. In 1812-15 Dr. Mantell commenced forming at Lewes, the magnificent collection of 1300 specimens of fossil bones, which is now in the British museum; and in 1822 appeared his "Fossils of the South Downs," a large quarto work, with forty plates, engraved by Mrs. Mantell, from drawings by the author. Another work was published by him about the same time, entitled "The Fossils of Tilgate Forest," and compared with the geological literature of the period in which they were written, they are meritorious productions.

In 1825, Dr. Mantell was elected a Fellow of the Royal Society, and he has contributed some important papers to its "Philosophical Transactions." For his memoir "On the Iguanodon," he had the honour in 1849 to receive the Royal Medal. He was also an active member of the Geological Society, and in 1835 was presented with the Wollaston Medal and Fund, in consideration of his discoveries in fossil comparative anatomy generally. From Lewes, Dr. Mantell removed about this time to Brighton, and his collection being materially added to, was purchased by the Trustees of the British Museum for £5000. Upon this he removed to the neighbourhood of London. Dr. Mantell took great delight in imparting to others a knowledge of his favourite science; he was fluent and eloquent in speech, full of poetry, and extremely agreeable in manners to all who manifested an admiration of his genius. He now turned his attention to the more popular and attractive works for which his name will be chiefly remembered. "Wonders of Geology," "Medals of Creation," "Geological Excursions round the Isle of Wight," and an enlarged edition of his "Thoughts on a Pebble," all of which are profusely illustrated, and have passed through several editions. His latest work was a hand-book to the organic remains in the British Museum, entitled, "Petrifactions and their Teachings." To these may be added, "Thoughts on Animalcules," and a "Pictorial Atlas of Fossil Remains," selected from Parkinson's and Arlis's palæontological illustrations; and among his early productions a handsome quarto narrative, with portraits of the "Visit of William the 1st and Queen Adelaide to the Ancient Borough of Lewes," which included some original poetry. Dr. Mantell was a most attractive lecturer, filling the listening ears of his audience with seductive imagery, and leaving them in amazement with his exhaustless catalogue of wonders.

* University of La., New Orleans, Oct. 1, 1853.—*Sill. Jour.*

THE CANADIAN JOURNAL

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All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, FEBRUARY, 1853.

CONTENTS:

PUBLISHED BY HUGH SCOBIE, TORONTO,

FOR THE

COUNCIL OF THE CANADIAN INSTITUTE,

AND FOR SALE BY A. H. ARMOUR & CO., TORONTO; JOHN ARMOUR, MONTREAL; PETER SINCLAIR, QUEBEC; JOHN DUFF, KINGSTON; AND JOHN GRAHAM, LONDON, C. W.

All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

The Canadian Journal.

TORONTO, FEBRUARY, 1853.

INCORPORATED BY ROYAL CHARTER.

Memorial of the Canadian Institute to the three branches of the Legislature to continue the Royal Magnetic Observatory under Provincial Management.

To the Honorable the Legislative Council of the Province of Canada, in Parliament assembled.

The Memorial of the undersigned members of the Canadian Institute, Humbly Sheweth,—

That your Memorialists have heard with much regret that Her Majesty's Government has determined to withdraw the Detachment of the Royal Artillery at present employed in making Magnetical and Meteorological Observations at the Observatory at Toronto, and to maintain that establishment no longer.

That your Memorialists being members of a Society incorporated by Royal Charter, for the purpose of promoting the cultivation of scientific pursuits in Upper Canada, view with great concern, the discontinuance of the only observations made systematically and upon a large scale, on any class of natural phenomena, in British North America.

That as regards the science of Terrestrial Magnetism, your Memorialists believe that all which has yet been effected in that subject, has but opened the way, to wider and more general enquiries; that the period over which the observations at present extend, is much too short to have elucidated completely the various annual and secular changes which it has brought to light, and that a prolongation of those researches, more particularly, which have indicated a connection subsisting between the magnetic variations and the *solar spots*, and a secular period in both variations, is eminently recommended by their novelty and interest.

That your Memorialists believe that the discontinuance of the observations so long and so systematically made in every department of Meteorology at this establishment, will not only deprive all those interested in that difficult and intricate subject, of a centre of reference, of comparison, and of support, the local and immediate value of which is, perhaps, more generally felt, than that of any other class of observations, but will also cut off the possibility of a large class of highly important enquiries, more particularly those which relate to the gradual change of climate which Canada is supposed to be undergoing, to their influence upon Agriculture, and to the periodical recurrence of seasons marked by peculiar manifestations of disease, and other important practical characteristics; which require a long, unbroken, and strictly comparable series of observations for their solution.

That your Memorialists conceive that it will be a reproach to a country so populous as Canada, of so large a public revenue, and possessing a University so largely endowed, if it suffers an establishment to fall to the ground which is of confessed scientific importance, and in whose continuance scientific men in the United States and elsewhere have repeatedly expressed their warmest interest.

That your Memorialists believe that the time has rather come when its operations should be placed upon a less restricted basis, and be extended from the special objects for which it was originally founded; to make it a centre of reference for all that large class of pursuits which involve periodical phenomena; and to include those higher departments of science, and more particularly of Astronomy, to which every Canadian must aspire to see his country one day contribute.

Your Memorialists, therefore, pray that your Honourable Council, will be pleased to take such steps, as to your wisdom may seem best, to effect the further continuance, by Provincial authority, of the Observatory heretofore conducted at the expense of the Imperial Government in Canada, after the withdrawal of the Military detachment; by placing it in connection with the Provincial University, or by maintaining it as an independent Provincial Establishment.

And your Memorialists, as in duty bound, will ever pray.

The following extracts from a correspondence printed by the Royal Society for the information of its members, in 1850, are interesting, in connection with the subject of the foregoing petition, and well calculated to assure the public that in placing the Observatory at Toronto upon a stable basis, the Government will only be carrying into effect what has been called for by men of the most eminent science in England and the United States. A country, whose public revenue approaches a million pounds currency, (£842,184, in 1851,) and whose enormous and costly public works attest at once the vigour of its resources, and the boldness with which it can be applied in measures of national importance, cannot be excused from bearing also a modest share in those burdens,—if they can be so called,—which a wise recognition of the claims of science has added, in almost every civilized land, to the necessary cost of civil administration or material developement. For what, after all, is Science? It is nothing but the investigation of those laws of nature and properties of matter, our acquaintance with which is the foundation of all national prosperity; and which, once mastered, enable us to subject the one, and bind the other, to our car of triumph. No country, capable of reciprocating the advantages she derives from others in this respect, can justly refrain from doing so.

There are other reasons why, at the present time, this colony should cordially accept the office to which it is called. In such an establishment as a national observatory, are the elements of the truest claims to national respect. Shall the British colonies acquiesce in the sentiment so often lurking in the minds of those with whom they have to deal in public or private relations; that a colony is by necessity a place of rude abundance indeed, and a liberty which trenches upon license, but where the refinements of life, the pleasures of the intellect, and the pursuits which lead to other distinction than that of wealth, can never be naturalized? To be respected abroad, we must respect ourselves, and seize with no timid or reluctant hand each occasion, as it arises, for displaying an enlarged and enlightened public feeling. We fancy that were the claims of the colonies to a perfect equality of social position with imperial Britain once cordially admitted, we should have much less of imaginary political grievances; but to attain this, we have to prove a right by measures which the consent of the civilized world receives as true indices of the advancement of a community. The observatory at Toronto may be obscure or distinguished,—a vigorous mainspring to a thousand scientific impulses,—or a mere machine for tracing a tame routine: this must depend upon its system and upon its head, and especially upon the measure of public liberality dealt to it. But what we contend for is, Canada deserves to have an observatory; can maintain, and can appreciate one. Its success, which time alone can test, and which no knowledge or ability at its head can render palpable to every one from the first, must be gained by degrees; nor will any delay in the production of scientific results of importance detract from the credit which will be justly due to the Canadian public for the formation and maintenance of such an establishment.

No. 1.

From Dr. Lloyd, President of the Royal Irish Academy, to the Earl of Rosse, P. R. S.

Trinity College, Dublin, Nov. 13th, 1850.

Dear Lord Rosse,—I have to acknowledge the receipt of your Lordship's letter, in which you do me the honour to ask my opinion on the question of the continuance of the Magnetical Observatory at Toronto.

I have long thought that the present state of some of the sciences connected with terrestrial physics demanded a *continuous* system of observation; and therefore the establishment of *permanent observatories* for their effective advancement: and I believe that I could easily cite, in support of this opinion, the authority of Humboldt, Herschel, Kupffer, and others.

I ventured to urge this view at the Magnetical Conference held at Cambridge a few years ago, under the auspices of the British Association; and I believe it was in the hope of carrying it out in this particular instance that it was resolved to recommend to Her Majesty's Government to continue the observatory at Toronto for a limited time, in the hope that before the close of the period arrangements might be made with some of the colonial institutions to take it up.

I am not aware what steps have been taken to carry out this object, or whether they have been taken and failed. Should the latter be the case, the question is of course altered; but, even in that case, I would venture to suggest the importance of the temporary continuance of the observatory on its present footing for some time longer, if it were only to carry out to its completion the trial of the self-registering of magnetical and meteorological instruments, by photographical processes, which has been instituted there on so large a scale.

The two methods which have been proposed for that purpose (and of which the importance has been recognized by Her Majesty's Government, by the bestowal of liberal pecuniary rewards), are both in operation at Toronto, and under the direction of Captain Lefroy, an officer who is able to give them the fullest trial, as well as to improve and perfect them, so that an experiment of great importance to physical science would probably be interrupted and lead to no conclusion if the observatory were now to be discontinued.

For these and other reasons I believe that it is desirable that an application should be made to Her Majesty's Government, requesting them to direct the continuance of the Magnetical Observatory at Toronto for some time longer, in case that none of the local institutions are in a condition to undertake its management.

I remain, dear Lord Rosse, yours very faithfully,

The Earl of Rosse, &c. H. LLOYD.

No. 2.

From Sir John Herschel, Bart., to the Earl of Rosse, P.R.S.

32, Harley Street, Dec. 28th, 1850.

My Dear Lord Rosse,—I entirely agree in the view taken by Dr. Lloyd, relative to the Toronto Observatory. It has become, from the fine series of observations already made there, a local centre of reference for the magnetic and meteorological observations of the whole of Canada and Northern America, of the greatest importance. If continued, whether under the Canadian Government alone, or aided by the Home Government, it would become the national observatory, the centre of diffusion of astronomical and of all exact scientific enquiry, and the zero point of a future trigonometrical survey.

If only temporarily continued, the working out of the recently adopted methods of photographic registry would form a very valuable contribution to the progress of those new methods which promise to supersede all others, both in point of exactness and economy; and I think it would be very desirable, if so continued, that some attempt should be made, pendente, to influence the colonial authorities definitively to take it up. Perhaps this might be done, on condition of another three years' continuance; I mean that it might be granted, provided a pledge could be obtained from the colonial authorities that it should afterwards be a colonial establishment.

I remain, my dear Lord, yours very truly,

J. F. W. HERSCHEL.

No. 3.

From the American Academy of Arts and Sciences to the Earl of Rosse, P.R.S.

Cambridge, U. S., Nov. 25th, 1850.

My Lord,—The undersigned, a committee of the American Academy of Arts and Sciences, have been directed to address your Lordship on the subject of continuing the meteorological and magnetical observations at Toronto, in Upper Canada.

The Academy has been led more particularly to take this step in consequence of the organization of a uniform system of meteorological observations in the United States, under the auspices of the Smithsonian Institution. Thirty-seven stations have been established in the State of New York, and twelve in the State of Massachusetts, under the superintendence of one of the committee (Professor Guyot) and are now in successful operation. It is unnecessary to say that this arrangement furnishes very important means of comparison with the observations made

at Toronto. This advantage will be still further increased by the addition which will, no doubt, be made in other parts of the United States to the number of stations.

These circumstances render it peculiarly desirable that the observations at Toronto should not be suspended; and the undersigned are instructed to express to your Lordship the earnest wish entertained by the Academy, that the requisite appropriations for their continuance should be made by Her Majesty's Government, and the hope that the Royal Society will exert its great influence to this end.

We have the honour to remain,
With the highest respect,
Your Lordship's obedient servants,
EDWARD EVERETT,
WM. CRANCH BOND,
A. GUYOT,
JOSEPH LOVERING,
JON. P. HALL,
Committee.

The Earl of Rosse,
President of the Royal Society.

Notes on the Geology of Toronto: by H. Y. Hind, Professor of Chemistry in the University of Trinity College.

(Read before the Canadian Institute, January 22nd, 1853.)

Mr. President, and Gentlemen,—

I must beg of you to accompany me on an imaginary trip to the shores of Lake Ontario, where the scene of our enquiries may be near the low cliff which rises abruptly from the waters of the Lake about a quarter of a mile to the west of the New Garrison. Standing at the base of the cliff, which at some places is nearly perpendicular, we may see a belt of yellowish clay about fifteen feet thick reposing upon numerous thin layers of rocks. We will select a spot where a very narrow beach of pebbles and shingle affords us standing room; the waters of the Lake, to our right and to our left, washing the low range of stratified rocks before us. The total height of the cliff, or rather bank, is about 20 feet. The uppermost layer of greyish sandstone rock immediately beneath the clay is about five feet from the Lake level, but if we progress westward towards the Humber, we shall find that it dips in that direction as well as towards the south, and either disappears below the waters of the Lake or is covered and concealed by superimposed yellow clay and sand. If we examine into the history of the yellow clay we shall find that it is of very recent origin, and belongs to what is termed the Drift formation. A careful search will assure us that it contains the remains of vegetables and animals whose species still live upon the face of the earth. In the City of Toronto, well-diggers have frequently found branches and even trunks of trees at depths varying from ten to forty feet in the Drift formation. It is not my intention to dwell upon the nature of the Drift as developed near Toronto, it is sufficient for present purposes to note the epoch during which it accumulated, and which is known geologically under the name of the Tertiary period. But what of those narrow bands of sandstone and shale which underlie the drift, and which present such marked features of regular stratification? they belong to what are termed Lower Silurian rocks; a name which plunges us at once into the almost illimitable field of geological speculation and history. When we see the clay reposing so evenly upon the surface of that narrow band of sandstone, we naturally suppose that some short period after the stripe of hard rock had been established by the slow process of deposition at the bottom of a lake or sea, the yellow clay was drifted upon it by the action of some violent current, at a time when the land around us was covered by the waters of the lake. Not so, however. Geologists inform us that countless ages passed away between the formation of the narrow stripe of sandstone and the superimposed Drift clay.

But how do they know it? Examine the narrow stripe of sandstone, separate a small block with a chisel from the layer of blue shale upon which it reposes, and we see below it numerous round bodies, which upon examination appear to be delicately organized, and to possess a beautiful cellular structure. They are corals, and are to be found in vast numbers and of diversified forms throughout those narrow bands of shale and sandstone. If we examine more minutely lower layers of the shale, we shall find numerous shells of many varieties, none however of kinds known now to possess living inhabitants in any of our lakes or seas. Upon further search we may discover a multitude of obscure vegetable forms, called fucoids, some of them possessing considerable dimensions, others smaller and less distinctly preserved. In whatever remains of animals or vegetables we meet with, we fail to recognize any alliance between them and those living species with which we are familiar. We infer then, that a vast difference in point of age exists between the Drift clays and the subjacent rocks. But how great may we suppose this difference in age to be? What interval of time has elapsed between the period when those ancient shells had living occupants, or those fucoids grew in a brackish sea, and the date of the accumulation of the vast mass of recent Drift which now presses upon them? In order to approach the answer to this question, we must refer to geological writers for their descriptions of other kinds of rock which are ascertained to be less ancient than the one we are now contemplating, and to the science of Palæontology which treats of fossil remains.

Having now introduced you to the rocks which are exposed in the neighbourhood of the New Garrison, and which form the foundation of the whole country between Toronto and the Rivers Rouge and Credit to the east and west, let us return to the lecture room where we may study more at our ease the history of those ancient deposits, and contemplate some of those remains of organic life of which they are the vast and enduring sepulchre.

First, then, with respect to the age of those rocks.

I need not remind you that geological ages are very indefinite periods of time, and relate to epochs in the history of the world which carry us far, very far beyond the period of man's history.

Geologists generally recognize thirteen groups of stratified or fossiliferous rocks, each group containing several members or formations which were probably deposited at different epochs at the bottoms of extensive seas or fresh water lakes. Each group is distinguished by numerous fossil remains which are peculiar to it. The thirteen groups are divided into three grand divisions named respectively,

I. Tertiary or Cainozoic, containing three groups.

II. Secondary or Mesozoic, containing four groups.

III. Primary or Palæozoic, containing six groups.

The Silurian constitutes the fifth group in descending order of the Primary or Palæozoic division. When we contemplate the enormous thickness of the various groups of fossiliferous rocks, and remember that they have all, most probably, been deposited one after the other at the bottom of seas, we can scarcely form any conjecture respecting the great antiquity of the rocks which form the foundation of the Drift upon which this city reposes. The members of this group are themselves of vast extent and thickness. They have been found to exist in various parts of the world, in Wales (whence their name, as forming a part of the ancient kingdom of the Silures,) in Bohemia, in Canada and in the Valley of the Ohio and Mississippi, &c. Silurian rocks have

been divided in two lesser groups, called the Upper and the Lower, or more recently into the Upper, Middle and Lower Silurian. Their united thickness in Wales has been estimated at about seven thousand feet. On this continent they attain much greater thickness. They constitute with one known exception the most ancient of all fossiliferous groups of rocks. During the period of the deposition of the Lower Silurian rocks the sea would appear to have presented an aspect of tranquillity, for we generally find their strata to preserve great horizontality, and to exhibit many of the characteristics of quiet and undisturbed progression. Some of the layers are beautifully ripple marked, as you may see from this specimen which was procured from the cliff near the New Garrison. Many of the vegetables they entomb seem to have been fossilized in the spot where they grew, and the casts of shells in the soft horizontal shales, which are found abundantly in this neighbourhood, exhibit minute markings when examined microscopically, in an admirable state of preservation.

The Lower Silurian rocks consist of several formations of considerable thickness which lie one over the other, and are the representatives of extensive periods which elapsed during their deposition. They are grouped because they contain in common certain species of fossils, but their order of superposition exhibits their relative ages, and their enormous thickness affords us a vague idea of the immensity of the duration of the period of which they are the record. In Western Canada the formations which are analogous to those of the Lower Silurian group in Britain, contain the subjoined subdivisions:—

PRIMARY GRANITE.

1. Trenton Limestone.
2. Utica Slate.
2. Loraine Shales, (Caradoc Sandstone.)

In the State of New York, and in some parts of Eastern Canada, and the eastern part of Western Canada, rocks older than the Trenton Limestone are to be found. It may be useful to mention the names of these rocks in order to establish the position of the Loraine Shales. The series would then be as follows:—

PRIMARY GRANITE.

1. Potsdam Sandstone.
2. Calciferous Sandstone.
3. Chazy Limestone.
4. Birdseye "
5. Black River "
6. Trenton "
7. Utica Slates.
8. Loraine Shales or Hudson River group.

From the foregoing table we are to understand that the Potsdam Sandstone is the earliest, and consequently the lowest fossiliferous strata found in this country,—or as Mr. Hall states,* "as having been produced at the dawning of the vital principle upon our planet; nothing which bears the semblance of having been organic is yet known in strata of anterior origin."

After the deposition of the Potsdam sandstone the Calciferous sandstone occurred, then the Chazy, Birds-eye, Black River and Trenton limestones were slowly accumulated one above the other, each entombing an infinite multitude of the denizens of the seas in which they were deposited. After these came the Utica Slates, and then the 1,000 feet thick Loraine Shales were slowly, and probably peacefully piled up over a vast extent of the earth's surface.

The Hudson River group or Loraine Shales is the rock to which we must refer the strata which are exhibited at the Garrison Common. Mr. Murray, the Assistant Provincial Geologist, observes in the admirable Geological Reports, that the Loraine Shales "compose the substrata of the whole country on the shore of Lake Ontario, between the River Rouge, in the Townshipof Pickering, on the East, and the River Credit, in Toronto Township, on the West, and sections of them may be seen in almost all the streams that intervene between the one point and the other."

"The estimate I (Mr. Murray) have made of their thickness brings it to 1,110 feet. How near this may approach the truth is difficult to say, but the result of such evidence as I have had it in my power to collect being still in favour of supposing the dip to be at about the rate of thirty feet to the mile, it is probable that the figures given constitute a tolerable approximation."

That the Loraine shales belong to the Lower Silurian group of Sir Roderick Murchison we have the subjoined authority of Mr. Hall.

"Commencing at the lowest rock known to contain fossils, we find the most important change in the typical forms to occur at the termination of the Hudson River group, (Loraine Shales) which is marked by a coarse sandstone or conglomerate, beyond which scarcely a single species has prolonged its existence. This point must be considered as representing that Horizon which in Great Britain is the termination of the Lower Silurian deposits. We never find, however, in the succeeding groups, a mingling of the fossils of the Lower and Higher rocks, which is regarded as taking place in England and Wales, where the strata are much disturbed. (Hall, Palæontology of New York.)

The Lower Silurian period and its relative distance in time from the present epoch, may be represented by the following table of the thickness of deposits which have accumulated since its termination; that is, since the time of the layers of sandstone and shale which we see at the Garrison Common beach:—

Rocks of the Modern or Cainozoic period.	feet 1800	Containing a small number of fossils identical with existing species.
Rocks of the Middle or Mesozoic period.	feet 5100	Containing fossils belonging altogether to extinct species.
Rocks of the Ancient or Palæozoic period.	feet 21,000	Containing fossils belonging not only to extinct species but also often to extinct genera and families.

Above the Loraine Shales we find an aggregate of fossiliferous strata having a thickness exceeding 26,000 feet, or five miles, not represented at Toronto, but which are nevertheless illustrative of that immense period which has endured since the formation which underlies the Drift upon which Toronto is built, was slowly and perhaps tranquilly accumulated.

The relation of the Drift and Loraine Shales may be familiarly shown by dividing a line into thirty equal parts, and numbering them 1, 2, 3, 4, 5, &c., the position of the drift would be approximately represented by the 1st division, the Loraine Shales by the 26th division, and the true Coal Measures by the 15th division. From the 27th division to the thirtieth, we should have the rocks which were formed before the Loraine Shales and the probable dawn of life upon the surface of the Globe. It is an important question in this country to ascertain the relation which exists in time between the true coal measures and the Loraine Shales; this may be roughly and generally represented by a series of formations; having a thickness of 12000 feet, which we may suppose to be placed between the uppermost layerof the Shales and the lowest stratum of true coal. And further, if we assume that the vast Devonian group has no representative in

* Palæontology of New York.

the western part of this Province, yet the rocks which have been discovered by Mr. Murray in the Western Peninsula, have a thickness exceeding 1000 yards, and are unquestionably of earlier date than the true coal measures, and must be considered as members of the upper Silurian group. They constitute the substratum of the whole Province west of the Credit. If coal is found in the western Province, it will be found above these rocks. These rocks seem, however, everywhere to be covered immediately by the Drift, so that the probability of finding true coal, is remote in the extreme. Brown Coal, similar to that which has been recently discovered in Vermont, may yet be found in Canada.

A glance at the layers of rocks at the Garrison Common beach, each layer apparently distinguished by some peculiarity in its fossil remains—some containing corals in abundance, others the remains of marine vegetables, others especially rich in bivalve shells, and others beautifully ripplemarked, —will probably convey a better idea of the time which elapsed during the deposition of five feet in thickness, exposed there, than any calculation based upon examples, from other localities. If we assume that other stratified rocks have required an equal period of time to attain the same thickness (five feet) by slow deposition at the bottom of seas ; our conceptions become still more defined of the immensity of that period which divides the Drift from Loraine Shales, when we remember that the thickness of the rock we have been contemplating is less than the one five thousandth part of the rocks of that unrepresented epoch, which existed between the respective periods of their creation.

Having thus given a very slight sketch of the position and comparative age of the Loraine Shales, I shall now confine my remarks to the narrow stripe of Shale and Sandstone which is exposed on the lake beach at the Garrison Common. For the space of a few feet, the section exposed during the summer of 1852, was quite perpendicular, and very clearly defined. The action of the waves very quickly destroys the face of the rocks, and rounds the edges of the exposed masses of Shale. At the present season, the water covers the layers, marked No. 14 and 15 in the subjoined list, and when the least wind is blowing, it is quite impossible to prosecute any examination with comfort, owing to the spray which arises from the dash of the waves against the rocks. In the summer months, in calm weather, there is a space of two or three feet between the foot of the rocks and the waters. About fifteen feet from the cliff, a very uniform row of large boulders of gneiss, washed from the drift, lines the shore for many hundred yards. These boulders it must be remembered, have no connection whatever with the stratified rocks, they belong exclusively to the Drift, and a walk along the banks will reveal many of their kindred, ready, almost, to fall out of the yellow clay in which they are embedded into the waters of the lake below.

Order and thickness of rocks on the Lake Beach, at the Garrison Common.

		Feet.	Inches.
Drift with Boulders		16	0
Loraine Shales.	1 Hard Yellow Sandstone	0	9
	2 Do Do	0	1
	3 Thin layers of blue shale	0	2
	4 Hard Calcareous Sandstone	0	1½
	5 Thin layers of blue shale	0	1½
	6 Hard yellow calcareous sandstone	0	1
	7 Blue shale	0	4
	8 Sandstone	0	3
	9 Layers of Shale	0	4
	10 Sandstone	0	1
	11 Layers of Shale	0	3
	12 Sandstone	0	5
	13 Shale	0	4
	14 Sandstone	0	4
	15 Lake Stone, Shale, Ripple marked	0	8

The fossil remains found in these layers of rock are exceedingly numerous, and are not confined to any one of the sub-kingdoms into which animals are divided by Zoologists. We find, indeed, the three kingdoms, Mollusca (snails, oysters), Articulata (crabs, worms), and Radiata (corals); and it is a question which has excited much discussion, whether the representatives of the first sub-kingdom, vertebrata (beasts and birds), have been found in the Lower Silurian rocks. For the honour of Canada it is earnestly to be hoped that the discoveries and speculations of Mr. Hunt, Chemist to the Provincial Geological Survey, cautiously advanced in the last Geological Report, may be thoroughly borne out and confirmed by future investigations. It will then be established that the leading types of animal structure have had their representatives throughout all ages of the world's history since the earliest period of created life. The following table extracted from Hall's Palæontology affords a very good view of the extent and diversity of animal life in the ancient and extensive Lower Silurian Seas, of which the Loraine Shales formed perhaps the latest deposit.

TABLE SHOWING the Number of Species of Animals and Plants peculiar to each formation, and also the Number common to several formations. (Hall's Palæontology of New York.)

CLASS OR ORDER.	Genera.	Species.	Restricted to The: Potsdam Sandstone.	Calcif. Sandstone.	Chazy Limestone.	Birdseye Limestone.	Black River Limestone.	Trenton Limestone.	Utica Slate.	Hudson Riv. group or Loraine Shales.	Common to The: Potsdam and succeeding strata.	Calciferous and succeeding Strata.	Chazy and Black River succeeding Strata.	Birdseye, Black River and Trenton Limestone, and Hudson River group.	Birdseye and Black River	Black River and Trenton.	Trenton, Utica Slate and Hudson River group.	Trenton Limestone and Utica Slate.	Trenton Limestone and Hudson River.	Utica Slate and Hudson Riv. group, or Loraine Shales.
Plantæ, - - - -	4	14	1	3	–	–	–	4	1	5	–	–	–	–	–	–	–	–	–	–
Incertæ Sedes - - -	3	4	–	–	–	2	–	–	–	1	–	–	–	–	–	–	–	–	1	–
Zoophyta - - - -	19	50	–	–	7	1	3	19	3	13	–	–	–	1	1	1 ?	–	–	1	–
Crinoidea - - - -	8	15	–	–	3	–	–	7	–	3	–	–	–	–	–	–	–	–	1†1?	–
Brachiopoda - - -	7	77	2	1	10	–	–	51	–	5	–	–	–	–	–	–	3	1	3†1?	–
Acephala - - - -	12	49	–	–	1	1	–	26	1	13	–	–	–	–	–	–	–	–	4†1?	2?
Gasteropoda - - -	17	71	–	8	13	9	–	28	–	6	–	–	1	–	–	1	–	–	4†1?	
Cephalopoda - - -	11	68	–	1	4	2	10	40	2	5	–	1 ?	–	–	–	1 ?	–	1	1?	
Crustacea - - - -	14	33	–	–	7	4	–	13	1	3	–	–	–	–	–	–	3	–	1	1
Total - - -	95	381	3	13	45	19	13	188	8	54	0	1	1	1	1	3	6	2	20	3

We will now proceed to examine the fossil remains, which a few walks to the cliff at the Garrison Common, have afforded me

an opportunity of obtaining. First then, with respect to the remains of an ancient vegetation. The Blue Shales contain many fragments, and sometimes entire specimens of Marine plants. Few of them are of comparatively large dimensions, having a diameter of perhaps an inch. Most of the specimens before you are crushed ; their original form having been cylindrical, as we see from numerous examples. It is a matter of considerable difficulty to refer, with accuracy, different specimens to their appropriate described species. The varieties I have met with are six or seven in number; but whether they all belong to as many different species, is a question I am unable to answer. At certain periods vegetable growth must have been most abundant, during the remote epoch of the Loraine Shales, fragments occur in particular layers in immense numbers. Corals are numerous in both the Sandstones and Shales of the cliff. Masses of the rock appear to be almost entirely made up of their calcareous remains. Some of the specimens are beautifully marked, a magnifying glass, however, is required to bring out their markings.

All of these little spheroidial bodies are corals, and exhibit when broken that peculiar organized structure which distinguishes them at once from similar objects. Some of them are several inches in diameter, and are covered with a shining substance, which proves, upon examination, to be sulphuret of iron. On breaking open one of these little round nodules, its history in part, and its mode of growth, is at once observable. In the centre we see a cylindrical stem possessing, apparently, a number of joints, it is a stem of an encrenite, of which the celebrated stone lilies are the most familiar illustrations. Round this stem the little coral has grown. Most of the white objects which are so frequently visible in large numbers at the surface of the lake stone a few inches below the water, are corals worn and polished by the action of the waves. The forms assumed by this species of coral (Chetetes Lycoperdon) are very numerous, it frequently occurs as a branched variety bearing no resemblance except in organization to these round specimens. One peculiarity connected with the rocks at the Garrison Common cannot escape the most superficial observer. It is the occurrence of layers containing multitudes of corals and the stems of encrenites, while a few inches above them or below them other layers enclosing an equal abundance of vegetable remains—fucoids—are prominently displayed. These circumstances indicate probably, very different conditions of the sea in which they grew, and a peculiar adaptation of the separate deposits for the growth of different kinds of organized forms. The layer of shale I hold in my hand, shows in as admirably manner, though on a small scale, the commencement and duration of a period favourable to the growth of encrenites and corals. Its lowest side shows only a series of regular laminæ without any fossils. The upper half is a mass of fragments of encrenites and the branched form of the common coral before mentioned. Here, however, we have a far more beautiful indication of the condition of the Silurian sea during the deposition of the ripple marked shale which answers to the number fifteen in the diagram of the strata. These ripple marks penetrate the stone to a considerable depth, as may be seen by splitting the specimen.

We seem here to have the distinct and permanent record of a gentle ripple on the beach of a shallow sea countless ages ago. We may even attempt to form a conjecture of the direction in which the wind blew, which disturbed the surface of the water in those remote times. If we suppose that the Loraine Shales here exposed, have received no lateral change in position, and I am not aware of any reason for conceiving such change to have taken place, the direction of the ripple marks, shows the direction of the motion of the little waves which rolled upon a gentle beach, and consequently determines the point from which the wind blew at the time, which appears to have been a little to the east of south. Appearances very similar to ripple marks are to be found in some of the layers above the one I have described. They are not, however, sufficiently distinct and continuous, to settle the question of their origin. These ripple marks appear to indicate the presence of a beach or boundary of the sea at that time. The occurrence of a beach of a fresh water lake during the present epoch, in the same locality, is an interesting coincidence. The gradual submergence of the land after the hardening of the sand on the Silurian beach, and the varying depths of the sea which eventually covered it is sufficiently indicated by the superimposed layers of shales and sandstone, with fucoides corals and other organic remains. Proceeding now to the other fossils, found in these rocks, we have here a huge orthoceratite, or straight horn, two feet seven inches in length, and about five inches in breadth at its broadest extremity. It was found between layers marked three and four, on the diagram. It is much flattened by pressure, but the markings in some parts are still distinct. The specimen was broken in the act of being raised from its sandstone bed. The orthoceratidæ (straight horns) constitute a very numerous family of molluscous animals. They were, probably, creeping animals protected by a very elongated shell, which is divided into partitions, called septa, connected by a tube or siphuncle, both of which can be seen in specimens on the table, from which the outer shell is removed. Some species of the orthoceratidæ were of enormous dimensions ; individuals have been found in this country upwards of six feet in length. The position of the living shell is supposed to have been upright, the large extremity downwards, the body of the shell swaying in the water. Upwards of sixty species have been described by Hall as belonging to the Loraine Shales, and the fossiliferous rocks which lie below them in the State of New York. Considerably more than one hundred species are now known to geologists.

The gastropods (snails, limpets) had their representatives in the Loraine Shales. The shells of these animals present many very beautiful forms. The number of fossil species found in the Lower Silurian is not great. The individuals, however, are generally elegant in their outline and structure.

The gastropods exhibit all the types of molluscous animals in a very prominent degree. This shell, *Cyrtolites ornatus*, is considered to be characteristic of the Loraine Shales. It is not uncommon in the rocks of the Garrison Common; and very beautiful specimens may occasionally be found. The shell is an important one; for, besides being characteristic, it is very easily recognized.

The conchifers, of which the oyster is a type, were rare at this period. The remains, however, of particular species belonging to some extinct genera are remarkably abundant. These are specimens of a very pretty shell, whose casts are exquisitely preserved in in the Soft Shales. It is named *Pterinia Carinata* and is also characteristic of the Loraine Shales. Its apparent resemblance to certain species of common sea-shells is striking, but not so much so as the resemblance of the one I hold in hand to the common muscle. It rejoices in the name of *Modiolopsis Modiolaris*. When layers of soft shale are removed from their resting place, and then carefully split with a knife or chisel, the casts of this shell, which is frequently revealed, presents such a modern aspect,—their forms and markings being so exact and perfect, and apparently so fresh,—that it becomes difficult to believe that we are looking at the cast of a shell, whose living occupant existed so far back in the unfathomable past that no effort of the imagination can convey the mind to the epoch of its life. It is truly a medal of creation, for while every portion of the original shell has long since been dissolved away, yet its exact impression has been produced in and retained by the hardened mud of the sea in which it once lived and died. This little slab is full of the impressions of a very interesting species of shell. The genera to which it belongs has members distributed, not only throughout

all ancient fossiliferous strata, from the early Potsdam sandstone upwards, but it also finds living representatives in our tropical seas. It is a *Lingula*,—probably *Lingula quadrata*.

Of Crustaceans I have been able to find but a very few remains. The casts of a small trilobite are not uncommon, and may be noticed in some of the small slabs on the table. This family is, however, well represented in the Loraine shales. Mr. Hall figures three species which are peculiar to that rock. Graptolites, a kind of fossil whose true character is still a matter of doubt,—whether they lie within the limits of the vegetable or animal kingdom,—are abundant in the shaly portion of the rocks at the Garrison Common. Upwards of twenty species have already been described as belonging to the Loraine shales and rocks of anterior origin. I have only been able to detect one species in this neighbourhood, which is shown in these small slabs of arenaceous shale.

I have now briefly adverted to the most important and characteristic fossil members of the three classes of the animal kingdom, which meet the eye during a very cursory and incomplete examination of layers of rocks about three hundred yards long and five feet in perpendicular altitude, in the immediate neighbourhood of this city. If such a superficial examination indicates the existence of abundant remains of an ancient vegetable and animal world within twenty minutes' walk of this room,—rich, most probably, in numerous undescribed and at present unknown species,—it is surely to be hoped that through the instrumentality of its members, the museum of the Canadian Institute will soon be enriched with the stony records of that remote epoch in the history of the world, which is so distinctly and beautifully traced out by these mute memorials of the past.

The Mineral Springs of Canada; by Henry Croft, L. L. D., Professor of Chemistry in the University of Toronto.

(*Read before the Canadian Institute January* 15*th*, 1853.)

It is not my intention, in the paper which I shall have the honour of reading before the Society this evening, to endeavour to give anything approaching to a detailed account of the mineral springs of this portion of Canada, inasmuch as neither my own observations nor those of others have up to the present time been sufficiently extensive to warrant any such attempt. Our knowledge of the subject is yet entirely in its infancy, as might naturally be expected, from the small number of persons resident in the Province who are capable of undertaking the necessary accurate investigations, from the wide extent of country of which comparatively little has been explored with respect to its natural productions, and lastly from the difficulty attending the transport from a distance of those large quantities of material which are required for an extended examination.

The object which I have in view in the present communication is simply to impress upon the members of the Institute the interest and importance of the subject, and to endeavour to enlist them in attempts to increase our knowledge by personal observation, and by the transmission to the Society of any mineral waters which to them may seem worthy of more particular attention. It frequently happens that springs are met with, which, from possessing a disagreeable smell or a peculiar taste, attract attention, and are believed by ordinary observers to possess valuable properties, but which, when submitted to the test of chemical analysis, are found to be nothing at all extraordinary. Many such instances have fallen under my notice, of which I will allude only to one from the neighbourhood of the Falls, lately submitted to me for analysis. The water, according to the accounts I received, has acquired a character of medicinal virtues, which are most probably imaginary, as one pint contains only 4.24 grains of solid matter, consisting principally of simple sulphate and carbonate of lime. Our knowledge of the subject being so exceedingly limited, the greater portion being due to the able researches of the talented chemist of the geological survey, I shall content myself with some few facts drawn from his experiments, as well as my own, and some observations upon our present knowledge of mineral springs in general.

The term mineral waters is generally applied to such as differ materially in their constituents, at least as regards quantity, from ordinary lake and river water. It has also been occasionally stated that mineral springs were characterized by their high temperature; but this is by no means a true definition, as many springs, especially those arising in elevated regions, possess an exceedingly low temperature. In its more general sense, the term "mineral water" might be extended to all waters whatsoever.—whether derived from the air, from rivers, from lakes. or from the sea; but it is usual to confine it to those possessing more or less of a medicinal character.

Until within a comparatively short period, the attention of chemists was principally directed to the detection and determination of those ingredients which, from their quantities, were evidently capable of exerting medicinal action; but of late years, since the methods of chemical research have been so materially improved, and the detection of many substances, even when in the most minute quantities, has been rendered possible, great attention has been paid to such investigations, and some very curious facts ascertained with regard to the presence in mineral waters of a great variety of substances, to which in some cases the medicinal virtues of the springs have been with reason ascribed.

The more ordinary substances occurring in mineral springs are the following: lime, magnesia, iron, alumina, potash, and soda; of acids,—carbonic, hydrosulphuric, silicic, and hydrochloric, besides certain organic bodies possessing an acid character.

The earliest additions to this list were made by the discovery of those valuable agents iodine and bromine in many springs; of fluorine and lithia in the hot springs of Carlsbad, and of phosphoric acid, baryta, and strontia in a few others. These three latter bodies have lately been detected by Mr. Hunt, in two mineral springs,—one in the parish of St. Joseph of Lanoraie, and the other in Fitzroy.

A much more remarkable discovery is that which has been more prominently brought forward since the year 1846, viz.—the existence of various heavy metals, or rather of their compounds, in a considerable number of mineral waters. Among the most curious of these ingredients may be mentioned arsenic, which seems to be much more universally diffused through nature than was formerly supposed. Some allusion to this fact appears in the writings of that prince of alchemists, Paracelsus (or, to give him his more extended title, Philippus Theophrastus Bombastus von Hohenheim), who mentions the presence of arsenic and orpiment in the water of Gastein. As Dr. Will properly remarks, but little credence can be given to his statement, when we consider the exceedingly imperfect nature of the analytical methods adopted at that period. The first notice of this remarkable substance was made by Trippier, who found it in a spring at Algiers, and the discovery has been confirmed and extended by Chevallier, Osann, Daubree, Walchner, and Will. The latter chemist examined not only various German mineral waters, but also the ferruginous deposits which are formed from them, and in which he succeeded in detecting, not only arsenic, but also copper, tin, lead, and antimony. The quantities of these ingredients, as may be supposed, are exceedingly small. As an instance, in 10,000,000 parts of one of the springs of Rippoldsau there was found six

grains arsenic, one-fourth oxide of tin, one-sixth oxide of antimony. one-fourth oxide of lead, and one grain oxide of copper.

Walchner and Daubree have examined the deposits from various springs, and moreover, a large number of rocks and soils, and have arrived at the extraordinary conclusion, that in almost all, there are contained traces of the above mentioned substances, more especially arsenic. This metal is therefore not only universally diffused throughout the whole world, but from the fact of its existence in meteoric stones, we must conclude that it is still more universal, and that it enters into the material composition of other planets than our earth.

To this list silver has been added, for that body is found to exist in minute quantity in sea water, in some springs, in plants, and even in animals, and very lately M. Mazade of Valance has announced that in the water of Neyrac, he has discovered the following substances : Titanium, Molybdenum, Tin, Tungsten, Tantalium, Cerium Yttrium, Glucinium, Zirconium, Nickel and Cobalt.

When we consider the manner in which mineral springs are formed, and the immense extent of strata through which they have to pass in their course to the surface, we shall not be so much astonished at their containing traces of those numerous substances, which all recent researches seem to prove to be more generally distributed through the crust of the globe, than was formerly supposed.

Attempts have been made of late years to connect mineral springs with the geological strata out of which they arise, and thus, from the nature of the spring, to draw conclusions as to the peculiar formation out of which the water flows, and the different deposits through which it has passed before reaching the surface: owing to the great difficulty, if not impossibility of tracing the course of water while trickling through the earth, concealed from our view, many erroneous conclusions may readily and naturally be arrived at, but still, certain general laws have been ascertained, to which I shall hereafter allude.

It has been well remarked by the President, in his opening address, that there exist natural obstacles to the successful prosecution of certain branches of natural science in this part of the province, viz. : the absence of mountain ranges, and the uniformity of the surface, and geological formations. The same causes, to a certain extent, produce a want of variety and interest in the mineral springs, for while we find that strong saline, and in many cases useful medicinal springs exist in great numbers in the upper strata, and very curious and interesting waters arise from the primitive rocks, the Silurian system is not by any means so rich in these natural productions as the Oolite and and the Granite. We have many springs it is true, but with few exceptions, they contain little else than salt, and belong almost universally to the class called saline waters. The few chalybeate waters that exist in Canada, are mostly so feeble, as scarcely to deserve notice.

Not only in their chemical characteristics do our springs belong to the more ordinary class, but even in their thermic relations no great eccentricities are to be observed. I am not aware of any spring either in Upper or Lower Canada, possessing an extraordinarily high temperature.

The heat of spring water may seem at first sight to be a matter of but little importance, but it is in reality, one of considerable interest, when we consider it in relation to the internal temperature of the earth. It has been found that the hottest springs are those which arise from the greatest depth, and we are thus enabled to draw conclusions as to the stratum from which the water is derived, from the temperature which it possesses.

If therefore, we find, that springs from great depths have retained the same temperature for ages, it is fair to conclude, that their originating strata have also remained the same, in other words, that the earth has neither lost nor gained in caloric.

Although some few observations have shown that the temperature of certain springs have been subject to change, the greater number of reliable experiments prove the heat to have remained unaltered. A number of springs in the Eastern Pyrenees have retained the same temperature for 65 years, the water of Carlsbad is just as hot now as it was 80 years since. The water of Mount D'Or which was used for bathing without cooling, at the time of Julius Cæsar, now possesses exactly the highest temperature that can conveniently be borne by the human body ; and hence, unless we conceive that the Romans were endowed with as thick and insensible a skin as the Turk, whose Marmont saw bathing in water of 92° or the juggler whom a recent traveller describes as lying in an oven in which tallow melted, and a fowl was cooked by his side, we must necessarily conclude, that the temperature of the water has remained unaltered.

With regard to the characters of mineral waters as depending upon the formation from which they arise; the following laws have been laid down :

The mineral waters of the primitive formation are almost all thermal, possessing a high temperature. Their predominant impregnation is sulphuretted hydrogen and carbonic acid, carbonate of soda, and other soda salts, few calcareous salts, except carbonate of lime in some peculiar situations, and but a small quantity of iron.

The waters of the transition, and older secondary rocks, assimilate to those of the primitive formation, but the temperature is considerably lower in most cases, free carbonic is much less common and sulphuretted hydrogen generally absent, salts of soda still predominate, but the carbonate is less frequent, and sulphate of lime more general.

The waters of the newer secondary and tertiary formations, are as distinctly characterized as those of the primitive rocks, placed at the other extremity of the series. They are all cold. Free carbonic acid in large quantities, is almost entirely absent, the predominating ingredients being carbonate and sulphate of lime, magnesia and oxide of iron.

Owing to local causes, many exceptions to these rules may be observed, and although in a district of uniform geologic character, it generally happens that the springs are of the same nature, it is occasionally found that waters of very different constitutions, arise within a very limited space.

In speaking on this subject, I cannot perhaps do better than quote Hugh Miller's observations on the celebrated Springs of Cheltenham. These springs all take their rise in the Lias, a formation which abounds in sulphuret of iron, lime, magnesia, lignite and various bituminous matters. The water which supplies the spring has its origin at a greater depth, viz., in the Upper New Red Sandstone, in which it becomes impregnated with salt, and then entering the lias dissolves up many of the ingredients above mentioned. Thus, the Cheltenham water probably falls on the Worcester Hills, buries itself in the soft folds of the Upper New Red, passes along the rock salt strata and enters a Liasic bed of bituminous shale, then into dolomitic limestone and afterwards through beds of belemnites, fish lignite, bitumen and other organic remains. Here, as Miller facetiously observes, it carries along a dilute infusion of what had once been the muscular tissue of a crocodile, and here the strainings of the bones of an iepthyosaurus. Miller alludes to the peculiar smell of the springs of Strathpeffer arising from the Old Red Sandstone,

as indicating the peculiar nature of the ooze of that formation, and remarks that visitors to the springs if not in time to breakfast off the fish of the Old Red Sandstone, are yet enabled to gulp down as medicine, an infusion of their bones and juices.

For the consolation of water drinkers it may be remarked that the above extracts are somewhat exaggerated, inasmuch as the quantity of organic matter contained in mineral springs is exceedingly minute, more especially in all that have fallen under my notice in this country.

According to the generally received theory of the formation of mineral springs, the water which falls upon the surface of the earth becomes impregnated with carbonic acid, it penetrates into deeper strata and takes up in most cases a quantity of common salt, this solution is supposed in its further progress to act upon the different rocks with which it comes in contact and to dissolve out those various substances which are discovered in the spring when it again reaches the surface. It has been objected to this theory that such a solution would not be capable of dissolving these numerous substances out of the rocks through which it passes, but this objection has been removed by Struve, who by passing water saturated with carbonic acid, and under high pressure, through the powdered basalts and phonolites of Toplitz and Bilin succeeded in most completely imitating the celebrated mineral springs of these localities.

It has also been objected that the enormous quantity of solid materials which would thus be eliminated from the interior of the earth, would in the lapse of years produce large cavities below the surface which must from time to time be filled up by the superincumbent strata. This objection, at first-sight, seems to be well grounded, when we consider the extraordinary masses which are evolved from certain springs. For instance, the Carlsbad spring gives out yearly, no less than 6,800 cwt. carbonate of soda, and 10,300 cwt. sulphate of soda, besides the large amount of carbonate of lime which constitutes the so called Sprudelstein. It must be remarked, however, that this disintegration does not take place at any one particular spot, but throughout a very large extent of surface, out of which the water trickles, and even if it were confined to one spot, the quantity of material which would be removed in the course of 500 years has been shown by calculation to occupy a space, which, when we consider the great depth from which the spring arises, would form but an atom, perfectly incapable of producing those disasters which the opponents of the theory have deemed possible.

With regard to mineral springs in the neighbourhood of Toronto, I have very little to say, as I am not aware of the existence of any which deserve more particular notice. Many springs in this vicinity, and even numerous wells contain a large proportion of salt, and some curious observations have been made in regard to the rapid variations in the quantity of this substance, contained in the water, but I am not aware of there being any spring in the neighbourhood which really deserves the appellation of a mineral water in the sense above described. Perhaps the most curious is the water which forms the rivulet running back of the Davenport Road, and flowing into the Don. This water is charged with carbonate of lime to a considerable extent, and produces petrifactions, or more properly speaking incrustations of a very beautiful character.

The deposits formed by this spring, although considerable in quantity, are very soft, widely different from those hard, stony formations, which are produced by many springs, especially that of Carlsbad in Bohemia.

It is scarcely necessary to allude to the interesting topics to which this simple incrustation of moss would tend to direct our attention, many of the ancient strata of the earth's surface, and several stupendous modern formations—as, for instance, the Travertine of Naples, depend upon causes which may be conveniently observed and studied within a mile of Toronto.

No other springs possessing any interest are to be found in the immediate neighbourhood of Toronto.

About the Falls of Niagara there are several springs reputed to possess medicinal properties ; several of them are impregnated to a greater or less extent with sulphuretted hydrogen, but the quantity is never very large, and the amount of saline matter contained in them is so exceedingly small as to render their medicinal properties rather doubtful.

The burning spring on the bank of the rapids, is interesting on account of the large quantity of inflammable marsh gas which is evolved with the water. A precisely similar phenomenon is observed in a spring a few miles distant from Hamilton. In both of them the saline matter has been found to be exceedingly small in amount.

This gas, light carburetted hydrogen, seems to be evolved from the earth in many parts of Canada, probably arising from the gradual decomposition of the organic matter contained in various bituminous rocks.

Near Ancaster there are two springs: the one which is called by Mr. Hunt the Sulphur Spring does not seem to be of much value ; but the other, called the Saline Spring, is remarkable for the enormous relative quantity of chlorides of calcium and magnesium it contains, as well as for the amount of bromine. From the great strength of this water, it is probable that it will be found to possess considerable medicinal virtue. Mr. Hunt's analysis is given below, the quantities being calculated to one pint. *Analysis No. I.*

Some years ago I analysed a specimen of a mineral water collected at Hamilton by Mr. Young. The exact locality is unknown to me, but the spring, although not very rich in the total amount of saline matter, yet contains so large a relative quantity of sulphate of magnesia, that it might probably be of value.—*Analysis No. II.*

A few miles west of Simcoe, in the twelfth range of Charlotteville, there is a spring, which according to Mr. Hunt is remarkable for containing a very large amount of sulphuretted hydrogen, more than one-tenth of its bulk. As regards this constituent, the Charlotteville spring is much richer than the celebrated Harrowgate water; and although the amount of saline matter is comparatively small, as may be seen from the subjoined analysis, yet there can be but little doubt that it may hereafter be safely applied for medicinal purposes, when certain obstacles which at present exist shall have been removed, and free access be afforded to this remarkable spring. *Analgsis No. III.*

The most remarkable of all the springs in the Province, are those which have received the name of Sour Springs. One of these exists in Wentworth, nine miles south of Brantford, and is generally known by the name of the Tuscarora Sour Spring. It is remarkable for containing a considerable quantity of free sulphuric acid, besides that portion in combination with potash, soda, lime, magnesia, oxide of iron and alumina. The water contains no trace of chlorides, and but a small quantity of sulphuretted hydrogen. Although such springs are among the great rarities of Europe, a considerable number are known to exist on this continent. In the State of New York there are several, and I have lately examined a perfectly similar specimen from St. Catharines. These waters might be applied to several useful purposes, if they could be obtained in sufficient quantities.

In the appendix attached to this paper, I have given a *resume* of the analyses of the most important springs found in this neighbourhood, and have added those of the Plantagenet and

Caledonia Waters, which have acquired some repute amongst us. I believe the St. Leon water has been examined by Mr. Hunt, but I have not seen his analysis.

It is by no means improbable, that in the course of time, as the country becomes more thoroughly investigated, other springs, equal if not superior to the Plantagenet and Caledonia Waters may be discovered in this portion of the Province. If, however, we cannot congratulate ourselves on the possession of very strong mineral springs, we at least are extremely fortunate in possessing lake and river water of a greater degree of purity than almost any other part of the world. The water of Ontario is of most extraordinary purity, and it is very probable that the waters of the Upper Lakes will be found to be still more free from extraneous matters. It would be of considerable interest to compare, by accurate analyses, the waters of Superior, Huron, Erie and Ontario. Should any members of the Institute who may have the opportunity of collecting such specimens be inclined to undertake the task of forwarding them to Toronto, it must be remembered that a very considerable quantity (several gallons) would be required, and it would have to be preserved in glass vessels with the greatest care.

The waters of some of the rivers of Canada seems to be exceedingly pure. The St. Lawrence water at Montreal has been analysed by Dr. Hall; and from some experiments which I have recently made on the Thames water (London, C. W.) it appears that the quantity of solid ingredients in one imperial gallon of 70,000 grains amounts to only 10.50, a purity which is equalled by only a few other waters in the world.

APPENDIX.

Analysis I.—Ancaster Saline Spring,	. .	Specific Gravity	. 102910
" II.—Mr. Young's Spring, Hamilton	"	"	. 100640
" III.—Charlotteville Spring	"	"	. 100270
" IV.—Plantagenet Water	"	"	. 100637
" V.—Caledonia Gas Spring	"	"	. 100620
" VI.— " Saline Spring . . .	"	"	. 100582
" VII.— " White Sulphur . .	"	"	. 100370

IN ONE PINT.

	I.	II.	III	IV.	V.	VI.	VII.
Chloride of Sodium	146,919	3,5688	- -	81,662	53,510	49,466	29,514
Chloride of Potassium	0,706	- -	- -	0,728	0,237	0,198	0,176
Chloride of Magnesium	38,966	- -	0,674	1,716	- -	- -	- -
Chloride of Calcium	98,324	- -	- -	0,954	- -	- -	- -
Bromide of Magnesium	0,792	- -	- -	0,056	- -	- -	- -
Iodide of Magnesium	- -	- -	- -	0,267	- -	- -	- -
Sulphate of Lime	5,966	7,8724	8,653	- -	- -	- -	- -
Sulphate of Magnesia	- -	33,4489	3,441	- -	- -	- -	- -
Sulphate of Soda	- -	11,8898	3,623	- -	- -	- -	0,141
Sulphate of Potash	- -	- -	0,391	- -	0,040	0,037	- -
Carbonate of Lime	- -	- -	2,342	6,233	1,136	0,902	1,612
Carbonate of Magnesia	- -	- -	0,138	- -	4,041	3,972	2,257
Carbonate of Iron	- -	- -	trace.	0,067	traces.	trace.	trace.
Alumina	- -	- -	- -	- -	0,033	trace.	0,020
Sulphuretted Hydrogen	- -	- -	1,364	- -	- -	- -	- -
Carbonic Acid	- -	- -	1,178	- -	2,671	2,242	1,082
Silicic Acid	- -	- -	- -	0,490	0,238	0,326	0,645
Carbonate of Soda	- -	- -	- -	- -	0,353	1,353	3,500
Bromide of Sodium	- -	- -	- -	- -	0,115	0,130	0,077
Iodide of Sodium	- -	- -	- -	- -	0,004	0,011	trace.
	291,673	56,7799	21,804	92,173	62,378	58,637	39,024

The above analyses (excepting No. II.) were made by Mr. Hunt, the accomplished Chemist of the Geological Survey, to whom we are indebted for by far the larger portion of our knowledge of the chemical composition of the products of Canada.

The Horse and its Rider.

BY J. BAILEY TURNER, ESQ., QUEBEC.

It seems to be the generally received opinion that the Human race now spread over every part of the habitable world, consisted of more than one primæval stock, clustered round the vicinity of a common centre, from which they radiated, and that that centre is to be sought for in that high region of Asia, which forms, as it were, the exterior border of the Kingdom of Thibet, or the ancient land of Zend, the district surrounding the Oxus and Taxartes and in the Khangai, Oases, or fertile spots found in the great desert of Gobi. In these Oases it is probable that the earlier tribes existed, employing themselves in, and maintaining themselves by, agriculture and pastoral industry, until their numbers increased to such an extent that they were compelled to migrate in order to procure the means of subsistence, and in doing so obeyed the Divine command, to increase and multiply, replenish the earth, and subdue it. With hardly one opposing circumstance, all the traditionary. historical knowledge of mankind, all our acquirements, all our domestic possessions, point to this region as that in which human developement took its first distribution after the Deluge, wherever may have been the great centre of the ante-diluvian population. Around this vast region are stupendous mountain chains, bearing the names of God, of Heaven, of Snow, or Purity,—and we have in the various Eastern mythologies, traditions, that here were the four rivers of Paradise, and that on the peak of Nanbundana the ark rested after the flood; while in Tartar legends, Nataghi, the Boatman God, and his family, are placed on another mountain, far to the north, in the Altaian chain;—another legend makes the ark rest on the peak of the Dove, a mountain on the western side of the Indus, now known as the Takt-y-Suleiman; and here I may observe, that nothing in the early Jewish legends, commonly known as the Books of Moses, is adverse to the supposition that the original seat of the human race was further to the East, or in a more central position in Asia, than is commonly supposed; in fact that it was near the eastern and not the western Caucasus. Even the Mosaic assertion that the ark rested on Mount Ararat after the flood, is nothing, because the word Ararat is generic, meaning simply a "Mountain Peak," and is therefore

just as applicable to any of the Peaks in the Hindu-koh, Hinducosh, Himmaleh, or Altai chain, as is the especial mountain in Asia Minor, marked Mount Ararat on the Maps, and as for localities assigned as that of Paradise or the Garden of Eden, there are at least twenty of them, between Thibet and Dales. In this region too, on the West side of Thibet, is the vast table land of Ramese, known in Eastern tales as the Back Bone of the world—not yet distinctly marked on the map. Here is the Lake Surikol, itself one of the great Asian mysteries; here are the mountains of the Hindu-Coosh, the probable primæval seat of the Scythic or Teutonic races, tribes that have spread in number and power till the third part of the earth is directly or indirectly under their control, and as every tribe or stock, at least of Caucasian, or Semi-Caucasian origin has its tradition of a primordial City of the Gods—the hero progenitors of their race—as the Assyrians had their Babel; the Indo Nigritians their Mægara the Indo-Persians their Pasagarda, and our own Teutonic ancestors their Asgard—so we find that the tribes bordering on the west and south of Thibet, acknowledged in their traditions the sanctity of Balkh or Rembala, a city not far from the Hinducoosh region, a little to the northward of which is Samarcand, from all antiquity, a city of great commercial importance as the seat of the largest trade in horses carried on in the whole East. It is no less strange than true, and it is a most astonishing confirmation of the theory that this portion of Asia was the original seat of the human race, that almost every animal which man has subdued to his use—every plant which furnishes him with food, is to be found in its indigenous state, in and around this truly wonderful region. Here are yet found in the wild state, the dog, the hog, the horse, ass and camel; the ox, sheep and goat; the elephant once stalked, in its majestic strength, through the forests on its southern border; and wild cats, precisely similar to the domesticated breeds, still haunt its jungles; every known species of domestic fowl originated in the south-east of Asia—many of them are yet found wild in the jungles. On the western side are to be found the parent plants of many of our fruit bearing trees and shrubs—the walnut, chesnut, filbert, apple, medlar, and cherry, and almost all the cultivated berries. Not far from here, at Slassa, in Thibet, the vine, given to gladden the heart of man, flourishes in the greatest luxuriance; wheat and barley of many varieties are indigenous on the skirts of this region, some species, so hardy that they thrive on the sides of the Himmaleh chain 10,000 feet above the level of the sea; buck-wheat and oats are found in the plains to the northwest; onions and turnips are met with wild in many parts. In the northern plains we find both flax and hemp, and in the valleys of Cashmere, melons, pumpkins and gourds. In no other part of the world are there found clustered together so many of the necessaries essential to civilization; none of them existed in the Western Caucasus, and therefore, we especially conclude that they must have been carried westward in their migrations by those nations, who must long have been acquainted with their value; nay, how do we know that the power to distinguish what was "good for food," was not part of the original revelation made by God to man, and derived by the post-diluvian nations from their fathers, miraculously preserved through that catastrophe. It is also probable that the tribes in moving westward met with many other edible fruits and roots, during their wanderings, which they carried with them to their final western resting place; the mulberry, apricot, and date palm; the olive, fig and plum, were, without doubt, brought in this way—and last of all the orange, which we know to be a native of China.

The horse, then, and its congener, the ass, we find to be indigenous in Central Asia, and in that part of it which is on very good grounds concluded by the best ethnologists to have been the primæval seat of the human race. We have strong reason to believe that the ass was subjugated to the use of man long before the horse; that such was the case we find indicated in many parts of the Old Testament legends, as in the sacrifice of Abraham, in his visit to Egypt, where we find it recorded of the reigning Pharaoh, that he had sheep and oxen, asses and camels—but nothing is said of horses—and in the account of the plunder of the subjects of Hamor by the Sons of Jacob we find asses mentioned among the spoil, but not horses.

But Bell, the author of a work entitled, "British Quadrupeds," is in favour of the opinion that the horse was first reduced to servitude by the Egyptians. We certainly know from the Bible and from paintings and sculptures extant on Egyptian monuments of almost fabulous antiquity that they possessed trained horses and used them for almost every purpose for which they are used at this day; but as the horse was not indigenous in Egypt, as we never find it mentioned by any author sacred or profane, as existing in that country in a wild state, but on the contrary, always as a trained or domestic animal, it is evident that the original horse-tamers must be looked for elsewhere, and where so likely as in the land where the horse was indigenous, in that Central Asia, the primitive seat of civilization, whence knowledge radiated with population to Egypt, India and China.

We shall look a little more closely into this question, for it is one of great historical interest. As population increased in the original seat of the human race; and when, in short, and to use a homely phrase, they wanted elbow room, it is natural to suppose that each stock or tribe departed on its migrations by the course of the great rivers, as a means of facilitating its progress, —but in course of time when these great roads of colonization had been trodden by many nations, a different result followed, at the hands of a very different class of colonists; by this time, man had learned to use the horse for his convenience, and there are many reasons, principally derived however from philological enquiries, which induce the belief that this conquest over brute power first took place in Central Asia, probably about Samarcand, and then in the neighbourhood of the Scythæ, who were, perhaps, themselves the first horse-tamers. With the acquisition of the horse came the era of invasion and plunder—first of all by means of expeditions in chariots and afterwards by mounted bands of warriors, who passed rapidly over immense distances, carried with them few or none of their wives and children, but invariably slaughtered or enslaved the males in the conquered countries and appropriated their female relations. Thus from conquest by military invasion, then arose privileged families and tribes in nearly every nation, who became a master class. It is worthy of notice that in the various mutations produced by these incursions of conquering hordes, no nations escaped servitude, but those who fled to the mountains, whither cavalry could not follow them—the people who lived in islands had no security, for where horses could not swim boats were rowed, and hence we find a master race even in the South Sea Islands. Except in Africa and in the very eastern part of Asia, where the Mongol or beardless type predominates, this master race is in every circumstance, directly or indirectly, of Caucasian origin. But it also appears that from very remote times, in the mythological periods as it were, small bands of these fierce and restless Scythians, had been accustomed to migrate towards the west, and as we shall see these migrations gave rise to the old fabulous legends of giants, titans, and so forth. Now these giants are invariably described, not so much as men of great stature, but of great strength and fierceness. They are always spoken of as fair haired and blue-eyed—they are the Gog and Magog—the Og and Goliath, the Nephilim, Rephaim and Anakim of Scripture—the Titans, Cyclops, Typhon and Anteus of the Greeks and Romans. The Bersarkees and Blaumaus of the Scandinavians, the Gams and Hunen of the Celts and Teutons. These are the giant Goths still figured on the brazen gates of Augsburgh, of Byzant-

ine workmanship, and brought there from the Palace of Theodore the Goth at Ravenna. In many of the legends these giants are described as fighting naked, and so late as the year 1578, a regiment of Scottish highlanders, men of Celto-Sythic origin, stripped themselves naked to a man before they charged the Spaniards at the Battle of Rymenant, near Malines. In almost every legend we find them spoken of as fighting on horseback. Bearing these facts in mind, we shall proceed to Egypt again. We have seen that in Abraham's time no mention is made of horses, but 205 years later we find Joseph his descendant riding in a chariot, and mention made of the issue of corn from the royal granaries for horses, among other domestic animals enumerated: and we also find that Joseph, when he held the highest ministerial power in Egypt, sent chariots drawn by horses to bring his aged father and his brethren to the banks of the Nile. It would therefore certainly appear that at some time between the visit of Abraham and the elevation of Joseph, a period of about 200 years, the Egyptians had possessed themselves of horses, but it is now ascertained that during this very period, Lower Egypt had been invaded by the Hyksos or Cushites, who held dominion then for many years, forming the 17th dynasty of Manetho, according to Lepsius, and having the seat of their government at Memphis, while the Egyptian kings retreated to Thebes in Upper Egypt. Now who were the Hyksos, Cushites or Shepherd Kings? Hyksos is a word of ancient Upper Armenia, and means a Haik wearer—it is the same as the old English word *nuck*. And we find that Snorro speaking of Scythia calls it Sarkland—the land of "Tunic," or "Nuck," or "Shirt" wearers. Cushites in the Septuagint translation of the Scriptures is rendered Æthiopians, but wrongly, for in the older historical parts of the Old Testament, the word Cush is invariably used in regard to nations living East of the Red Sea; these Hyksos then were nothing more than a band of predatory Scythians, fair-haired and blue eyed, who in chariots or on horse-back, had penetrated from high Asia into Egypt, and then became for a time the master class. It is supposed that the Hyksos were expelled from Egypt by Thothmes the first, of the 18th dynasty, according to Dr. Hales, about 27 years before Joseph's administration during the years of famine; and also, according to Dr. Hales, that after his death the Israelites, then living in Goshen, and greatly increased in numbers, began to meditate revolutionary projects, and invited the Shepherd Kings—the Hyksos—who after their expulsion had retreated no further than Hanran, on the river Jordan, to re-enter Egypt, which they did, and re-established the pastoral tyranny, subjecting both the Egyptians and the Israelites to their oppression. This was the new dynasty, "the King that knew not Joseph." Now I think that every candid mind will admit on a consideration of these facts, the great probability that the horse was first brought into the deserts of Arabia and into Egypt by these hordes of Nomadic conquerors, that on their first expulsion, their horses and cattle fell as spoil into the hands of the Egyptians, and that the horses greatly multiplied in numbers, and became celebrated for beauty, strength and spirit, and if we can believe the profane authors, the multiplication must have been truly enormous, for we find them, not long after the expulsion of the Hyksos, speaking of Ramses Niamoun the 3rd, surnamed the Great, the Sesostris of the Greek authors, and the fourteenth ruler of the 19th dynasty, according to the chronology of Rosellini, and representing him as going on an expedition to the East with 27,000 war chariots, but this is probably an exaggeration, for in the time of Setos, the 1st King of the 19th dynasty, according to Lepsius, and supposed to be the King, "who knew not Joseph," and who perished, according to the Jewish writers, in the Red Sea, we find that monarch could only muster 600 chariots of war, "all the chariots of Egypt," wherewith to pursue the Israelites. Now as each chariot was drawn by two horses, this is a vast reduction from the immense numbers assigned by Heroditus to Ramses, unless we consider that nearly all the horses in Egypt had perished only a few days before, under the "very grievous murrain," which constituted the fifth plague of Moses, and under the fearful storm of hail which "smote throughout all the land of Egypt, all that was in the field, both man and beast."

Although by the law of Moses the Israelites were forbidden to multiply horses, and expressly commanded not to return to Egypt for that purpose, we find that King Solomon disobeyed the command, and in his reign, for the first time in the history of Israel, we hear of the importation and use of horses, that King having purchased horses for 1,400 chariots and 12,000 troopers. Previous to this time, we argue from various passages, that infantry constituted the whole strength of the hosts of Israel, that oxen were almost entirely used for agricultural purposes, asses and mules for journeying from place to place. From the Hyksos or Scythian nomachs, it is probable that all the nations surrounding Israel obtained horses, not long after they were furnished to the Egyptians, for King David, in the Psalms, constantly speaks of horsemen as among the number of his pagan enemies, and in the time of his grandson Rehoboam, Shishak, the King of Egypt, came up to war against Jerusalem with 1,200 chariots and 30,000 horsemen, and among them are enumerated some tribes from the Eastern bank of the Red Sea. It is a fact worthy of notice, that though we find the sculptured resemblances of horses and chariots without number on the monuments of Egypt, employed both in military and domestic uses, there is but one known instance of a mounted Egyptian; the sculptures show the Egyptian horse to have been of a very high bred race, the eye is fiery and prominent; the head small and beautifully set on; the neck arched, the body well rounded; the legs clean and the tail with a fine curve, long and flowing; the action is depicted as spirited, giving an idea of swiftness and courage. The horse was not a sacred animal among the Egyptians; no portion of its body has even been found mummified, and there are very few instances of its figure being found among the hieroglyphics.

In the most ancient annals of India, dating from a period contemporaneous with that of Moses, horses are mentioned, and we know that the sacrifice of a horse even at this period, was one of the most awful solemnities attending the worship of the Goddess Kali. And in the Mahabarata, an old Indian heroic poem, dating back certainly not less than the 6th century before the Christian era, and recording the first great military religious invasion of India, in the enumeration of the corps of armies both chariots and cavalry are mentioned, and this was a northern invasion. The conclusion therefore is that the original seat of the horse was neither in the plains of the Nile, nor in those of Hindostan, nor in Syria, or Arabia, but in the Centre of Asia, whence at various periods of the world's history, of many of which we have now not even the tradition, radiated eastward, westward and southward tribes of Nomad wanderers, the first tamers of the horse to bit and bridle, the rapidity of whose movements and conquests could never have been effected without such an animal, and in whose country both it and the ass existed in a wild state.

And here we may take a glance at another race of mounted warriors, a people of antiquity so distant, that even those whom we call the Antients, placed them back in the heroic or fabulous ages, and attributed to them a wondrous origin and still more wondrous form; I mean the Centaurs, depicted by the poets and sculptors of old as half-man and half-horse, the portions of the two beings constituting a distinct whole. At the bottom of every fable there is generally a fact, and the fact would appear to be, that at some very remote period, or as it may be poetically said in the old heroic days, when demigods performed prodigies on the earth, some wandering tribe of northern horsemen, more adventurous than their fellows,

pushed across from Central Asia towards the Black Sea, passed to the northward of it, and crossing the Danube, fell upon Thrace and Thessaly, in which country they established themselves; and for many centuries after, the Thessalian horsemen were among the most renowned in the world. The Pelasgian race then inhabiting these countries, either had no horses or very indifferent ones, not fit for military uses; and the Centaurs were probably the first horsemen they had seen. And as to the ignorant everything unknown is a wonder, they invented the fable, which gave scope to the genius of Phidias, and to these times and our own country the friezes of the Parthenon. The Pelasgians were not more surprised at the extraordinary appearance of their Scythian invaders, than the Mexican Indians were at that of the Conquistador Cortez, and his iron-clad troopers. If, as many ethnologists suppose, even at this early time, a part of the Centaurs separated from the others at the Carpathian chain and pushed onwards to the Baltic, we should at once have a clue to the first arrival of that race in Northern Europe, variously denominated Asia, Gotha, Scythians, Scandinavians or Teutons, a part of whom at a period much nearer our own time, invaded India, but were routed and expelled by Vikia-Maditya, King of Avanti, about 56 years before the Christian era, and who recoiling, carried with them many of the Hindoo religious elements, thus accounting for the horsemen gods, the horse sacrifices, and the mixture of Sanscrit words in the language of the Scandinavians.

The invasion of Thessaly by the Scythian Centaurs, synchronous as I observed before with the heroic age of Greece, nearly so with the expulsion of the Hyksos by Thothmes, with the invasion of Asia by Ramses the Great, and of India by other Scythic hordes, sufficiently marks the periods of great movements through the whole East, and of the general appearance of horses, chariots and horsemen.

I alluded in the earlier part of this lecture to certain philological reasons for believing that Central Asia was peculiarly the land of the indigenous horse. Philology means an inquiry into the origin and construction of language, and in the work of a very celebrated naturalist, we find a most elaborate argument to prove that by a strict enquiry into the names bestowed upon the horse in the most ancient known languages, much light may be thrown both on its primitive seat and period of domestication, and here perhaps will be the proper place to give you the substance of his statements. In Hebrew, the oldest of the Semitic languages now studied, many terms are applied to the horse and its congener, the ass; of these, if we take the words *pra*, *para*, *pered* and *perdah*, to mean an ass, or mule, or more properly any beast to ride on, and compare them with the words *pares*, horses, and *parasim*, Persians or Parthians, that is, horsemen, we see that the original root of the word must be sought for farther east, and that it belongs to the language of a nation of cavalry; and in a secondary sense, an exalted people—that it is in reality a word of Zendic or Sanscrit origin, probably allied in dialect with the Moso-Gothic or Teutonic words *pherd*, *perd* and *paert*, which word is also the root of Latin word *ferro*, to carry, *phra* or *pher*, literally meaning the "*car-borne*," the "*chariot-rider*." We may therefore suspect that these, with many other words of Scythic or Indo-German origin, to be found in Arabic and Hebrew, and other Semitic languages, were borrowed from the horsemen invaders of Egypt and Arabia. It is the same word that is one of the titles of the Sun-God—the charioteer or image of glory and beauty; and in the Scandinavian mythology is synonymous with *freya*, or beauty and pre-eminence. In Babylonish we have the words *ninus* and *ninnus*, and in the Greek, *Ginnus* from an old Asiatic root always meaning a young foal; and in Persia or Parthian we have *pful*, a horse, or a sun-beam—or a horse consecrated to the sun—now one of the Centaur Scythians, whom we have spoken of, was named, Pholus, which seems to be identified with this word *pful*, —*asp*, is another Parthian name of the horse, and this word and pful were both applied as epithets to a long line of Kings and Princes, and in many Greek authors we find the names of Aspii and Arimaspii horsemen, and mountain horsemen, applied to two very ancient nations of Central Asia, another strong proof that it was the original habitat of the horse. Whatever the term may be, the original idea or root seems always to have a reference to conveyance, and is ever associated with elevation, grandeur and velocity. In the Arabic languages alone there are some hundreds of words of Scythian or Northern Asiatic derivation,—most likely derived from an unknown parent stock in Zend, and closely allied to Gothic and Sanscrit. The Indo Sacæ, and Indo-Germani, had long previously gone south, before, at a much later period they removed westward, and consequently their passage through Arabia or the adjacent countries bordering on the Western Caucasian range would have had but little effect on any Semitic languages. Every expression that we find points to the far East as the land of horses, and horsemen; that land being distant from Arabia, as the Lord threatens the Israelites that he would bring on them "a nation from afar, from the end of the earth, *as swift* as the eagle flieth." And it is moreover distinctly said, "a nation whose tongue thou shalt not understand." Who then so likely to have been the means of ingrafting as it were these words of Northern origin on the Arabic and other Semitic languages, as the giant tribes of Scythian nomads, in the far off mythological periods, or the later Hyksos, the Shepherd Kings? In the Sanscrit languages, among the old names of the horse we find none at all distinctly sounding *pra* or *perd*, the epithets being *aswa* and *turanga*—the former of these being most probably the root of *asp*, and the other of *turan*, the land of the swift, the ancient appellation of Bokhara, significantly denominated the "Highland of God," or the valley of the Jaxartes, a river in the Hindu mythology, always represented as issuing from a horse's mouth, another certain indication of the quarter whence horses became known to Southern Asia. It is believed that both *asp* and *aswa* are derived from some still older word, which is also most probably the root of the Greek *hippos* and the Latin, *equus*, by Pelasgian modifications, as are also the Finnic words *uppo* and *upping* so commonly met with in Norway and Sweden. A similar slight change marks the Hebrew word *ramach* and the Celtic-Scythic word *march*, a horse or mare.

Tne Tuskish name for a horse is derived from a word signifying red or bay, and this very word bay, in Latin *baclius*, and in Teutonic bayard, may be of Arabic origin, when *beya* means the same animal, or this may be perhaps merely a coincidence, from the Arabic, Pelasgic and Teutonic, having the same root. Therefore, seeing that the root or original of all these words, in whatever language they occur, may still be traced to a Scythic origin or language. It is concluded from this philosophical fact, that the horse came to Egypt and the adjacent countries, as well as into Hindostan, already domesticated, from the north-east, and that is the reason why we find no mention of it till the time of Joseph. In Asia we find that the northern half of the whole male population, and even sometimes the female population have used the saddle ever since human tradition began; while in the southern half the better classes only, since the commencement of profane history, have used the horse, and to this day many of the wandering tribes of Southern Asia prefer the camel to the horse. There is no evidence whatever, written or traditionary, that there ever were wild horses in any part of Arabia, every portion of the country has been accessible from the earliest periods, and visited by wandering tribes, and there is no where any district or cover fit for the propagation of horses in a wild state. It is therefore fair to conclude that the horse was unknown in Arabia, until conquerors of the giant race, Scythians or Hyksos, brought them

from Upper Asia, and that these hordes and their animals were incorporated with the original inhabitants, or that the horses were left—and many words of the language, when the riders had perished or were expelled. Ezekiel seems to allude to such an invasion as this when he speaks of a "King of Kings" from the north, with horses, and with chariots and horsemen. "A King of Kings," literally Changan, the name now given by many Tartar tribes to their chiefs.

(To be Continued.)

Extracts from Exhibition Lectures.

Candles.—The manufacture of candles has recently been much improved by the aid of Chemistry. Tallow candles, or their more expensive substitute, wax, were generally used till within the last twenty years. The tallow itself was long very impure, containing cellular tissue, which was only partially removed in the form of a scum, known as "cracklings." This impurity rendered the light unsteady, and obstructed the wick. The old method of purification still largely used in this country, though superseded on the continent and in Dublin, whence such good tallow candles were exhibited, has been displaced by a process of treating with sulphuric acid the tallow melted by steam. Much of the smell is thus removed, and a larger amount of a purer tallow is obtained. The researches of Chevreul had shown that fats consist of fatty acids, combined with a kind of sugar named glycerin, which it was important to remove; this glycerin, removed in candle-making, is now used as liniments in cutaneous affections, and is employed as a remedy in deafness and rheumatism. By boiling with lime, an insoluble soap is formed, while the glycerin remains dissolved in the water. This lime-soap, decomposed by a stronger acid, yields the fatty acids in a purer state. But there are generally two solid acids mixed with a fluid one; and the latter is easily removed by pressure, the solid fats remaining. The solid acids are made into the beautiful candles erroneously called "stearine." The solid acids, crystallizing rapidly, were ill adapted for candles; but the introduction of arsenic in small quantity prevented the crystallization. The public were justly alarmed at this dangerous practice, and the manufacture was threatened with extinction, when it was found that a small per-centage of wax produced the same effect, and that large crystals might even be prevented by a careful regulation of the temperature. This evil was therefore avoided; but a more serious one arose. The ashes of the wicks, becoming heated, cause the fatty acids to splutter; and this was a grave inconvenience. These ashes, however, form a fusible glass with borax; so the wicks are dipped into a solution of this salt, and the difficulty removed; a salt of bismuth is also used for this purpose. Snuffers, however, are always troublesome, and a self-snuffing candle was an important want. Chemists have told us that flame is hollow, its centre containing no oxygen capable of supporting combustion; and the wick, being in the hollow part, excluded from the air by its fiery prison, is charred, and diminishes the light. If the wick could be made to turn outwards, it would reach the exterior air and be consumed, whilst the glass formed by the action of the borax on its ashes would also be removed. This beautiful scientific fact was attained by the introduction of plaited and twisted wicks, the tension of the threads forcing the wick to curl outwards to the exterior of the flame, where it is rapidly burned.

Another great improvement now took place. In preparing the commercial stearine from palm-oil or tallow, it is essential to remove the glycerin, and this had been accomplished by saponifying them with alkalies. Sulphuric acid, acting on fats, unites with the oily acids and with glycerin; the former compounds are decomposed by water and become insoluble, while the latter, from being soluble, is removed; the oily acids blackened with the destroyed organic impurities, are now distilled, and it is found that a jet of steam, heated somewhat in the manner of the hot blast, aids their distillation, the fatty acids passing over in a comparatively pure form, while the residual black resinous matter is made into black sealing-wax. Candles may now be made from the distilled fatty acids at once, or they may be pressed to remove the oleic acids.

The oleic acid, both from this mode of manufacture and from that by alkaline saponification, is principally exported to France, where it is made into a hard soap. In this country we have yet to acquire the method of doing this. The excellence of the acid saponification is, that it is applicable to palm-oil and to the most impure and fœtid fats; by its means the finest candles may be made from the waste of the glue-maker and from the oily residues obtained by the decomposition of the waste lyes of the woollen manufacturer and the bleacher. As the first beautiful process of saponification sprang from the abstract researches of Chevreul, so has the last elegant method arisen from the scientific investigations of Frèmy, although both of them have been reduced to practice, with many improvements, by the manufacturers themselves. The importance of the manufacture may be understood when I state that one company (Price's Candle Company) possesses cocoa-nut plantations in Ceylon, and employs eight hundred workmen in its five manufactories in London, using a capital of nearly half a million, and dividing profits to the extent of £40,000 per annum.

Chemistry has not yet done so much for the manufacture of wax candles as might have been anticipated. Wax is still bleached by exposure to air and light, and the operation has been hastened more by mechanical than by chemical contrivances; the bleaching of wax is a tedious and often a difficult process, and demands greater atttention from chemists than it has received; the Brazillian mahogany-coloured wax, produced by a black bee hiving under ground, has not yet been bleached by the sun, and might be imported in considerable quantity if Chemistry offered means for removing its colour. I do not allude to what Chemistry offers to do; but it would appear that paraffin and oil from coal, and possibly from peat, may dispense, to a certain extent, with the necessity for sperm-whale fishing.

Coal-gas.—The manufacture of coal-gas is an admirable example of the benefits conferred by Chemistry in all the three divisons of its uses; for it not only economized human power and time, but it has utilized all the products employed in removing its impurities. Coal-gas was only introduced to use at the beginning of this century, and the public prejudice which had to be overcome, and the difficulties to be surmounted in its actual manufacture, may still be remembered by many of my hearers. It was no mean innovation to replace tallow candles and oil lamps by an air streaming through pipes, but the difficulties attending its purification from noxious ingredients appeared even more insuperable than to reconcile the public to the innovation: the gas had an insupportably fœtid odour, and certainly injured health when burned; it discoloured the curtains, tarnished the metals, eat off the backs of books, and covered everything with its fuming smoke. It required a man of courage, as indomitable as Winsor, its great advocate, to persuade the public to continue its use until means were found for the removal of these noxious qualities. Here Chemistry, itself the father of the manufacture, was called in consultation. The impurities in the gas are sulphuretted hydrogen, which tarnished the metals, and with sulphuret of carbon produced sulphureous fumes; ammoniacal compounds, which changed the colour of dyes and acted on leather; tarry vapours, which caused the deposition of soot; and all these had to be removed. The

ammonia and the tar were partially condensed in tubes kept cool, the sulphuretted hydrogen and carbonic acid were removed by lime, and the ammonia by washing the gas with water. This last operation was the least effective, and new substitutes had to be devised, one of which I may mention; superphosphate of lime, consisting of bones dissolved in sulphuric acid, only required ammonia to make it a powerful and excellent manure; trays of this superphosphate were therefore placed in a chamber through which the gas passed, and thus the ammonia was removed, while the phosphate became enriched. A new method is now extensively employed, and shows the tendency to simplification resulting from discovery. By this method almost all the conditions of purification are satisfied by one process; the gas, after cooling, is at once taken into a chamber containing carbonate of lime and sulphate of iron; these, reacting upon each other, produce oxide of iron and sulphate of lime. The gas, streaming through this mixture, gives up its sulphuretted hydrogen to the oxide of iron, while the carbonate of ammonia. decomposing the lime salt, forms sulphate of ammonia and carbonate of lime, the lime thus being reconverted to its original state; the gas before before being passed into this mixture is occasionally led through chloride of calcium in order to aid the removal of the ammoniacal salt. When the mixture has done its work it is exposed to air, and the sulphide of iron absorbing oxygen is converted into a basic sulphate of iron; hence the mixture is similar in its purifying character, except that it contains sulphate of ammonia, which may be washed out and preserved, while the residue is employed over and over again. By this elgant process the noxious sulphur compounds are utilized in the fabrication of sulphate of ammonia, and the mixture seems never weary of performing its duty; hence not only is the purification performed at one process, but the noxious ingredients are converted into compounds of much value. The waste and badly-smelling products of gas-making appeared almost too bad and fœtid for utilization, and yet every one of them, Chemistry, in its thriftiness, has made almost indispensible to human progress; the badly-smelling tar yields benzole, an ethereal body of great solvent powers, well adapted for preparing varnishes, used largely for making oil of bitter almonds, of value for removing grease-spots, and for cleansing soiled white kid gloves. The same tar gives naphtha, so important as a solvent of Indian rubber and gutta percha; similar tar, when made from wood, yields creosote, a powerful preservative of animal matter, and much employed as a medicinal agent. Coal-tar furnishes the chief ingredient of printer's ink, in the form of lamp-black; it substitutes asphalte for pavements; it forms a charcoal when mixed with red-hot clay, that acts as a powerful disinfectant. When the tar is mixed with the coal-dust, formerly wasted in mining operations, it forms by pressure an excellent and compact artificial fuel; the water condensed with the tar, contains much ammonia, readily convertible into sulphate of ammonia, a salt now recognised as being of great importance to agriculture, and employed in many of the arts. Cyanides are also present among the products of distillation, and these are readily converted into the beautiful colour known as Prussian blue. The naphthaline, an ememy to the gas-manufacter by choking the pipes, may be made into a beautiful red colouring matter, closely resembling that from madder. This, by its transformation, promises an important, hitherto not yet realised useful product. Coal, when distilled at a lower temperature than that required to form gas, produces an oil containing paraffin, largely used as an antifrictional oil for light machinery.

In the isolated cases of manufactures, adduced as types of the importance of chemical appliances to industry, I have referred to general subjects rather than to individual objects in the Exhibition; because these Lectures ought, in obedience to the desire of their Royal suggester, to be indications of consequences rather than references to special excellencies. The illustrations have been restricted to Chemistry, not that I unduly exalt its importance, but that we are wisely instructed to confine our attention to the branch of knowledge most familiar to us. All these instances, however, are real consequential supports of a text which has already been discussed in its general bearings in another Lecture.* The text was this,—that the progress of abstract science is of extreme importance to a nation depending upon its manufactures. It is only the overflowings of Science, arising from the very fulness of its measure, that benefit industry. When water falls from a higher to a lower point, it, to a certain extent, increases the velocity of the rotation of the earth, and the sum of the increments of the velocity of all falling waters would soon be sensible, were it not that the sun, lapping them up, restores them to their sources, and by removing them farther from the centre, compensates for the increased velocity given in one locality; while at the same time they fertilize the lands on which they fall. So is it with Science and Industry. The overflowings of abstract Science give their first impulse to the country producing them; but the Sun of knowledge soon raises and distributes them to all lands, which receive benefit in just so far as the ground is prepared for their fertilizing influence. The discoverer of abstract laws, however apparently remote from practice, is the real benefactor to his kind; in reality, far more so than he who applies them directly to industry. Yet in our Mammon-worship we adore the golden calf, and do not see its real creator. It is abstract and not practical Science that is the life and soul of Industry; practical appliances are the organs through which the God-born truths pass for the sustenance of its general frame. The cultivators of abstract Science, the searchers after truth, for eternal truth's own sake, are —to borrow a simile, I believe of Canning—the horses of the chariot of industry; those who usefully apply the truths are the harness by which the motion is communicated to the chariot. But is the chariot drawn by the horses or the harness? Truth to say, in this country of ours, and mark you well, in no other country in Europe,—we honour the harness, but neglect the horses. It is the harness that is gilt; the hard-working horses too often receive but meagre fare. Now, in all this, I tell you a living truth; one far more connected with the actual material progress of our nation than you may be aware of. The published opinions of Babbage and Herschel, men who have a right to pronounce judgment on this subject, assure us that England is rapidly declining in Science. It is most important that we should ascertain the real cause of this decline. The cause would appear to be, that we chiefly honour those who are useful in our time and generation; that our eyes are too eagerly bent upon the golden prize, for which we are all running; and that we can only afford to throw a kind of theoretical squint of recognition on those men, who are looking for sublime truths, careless as to whether they will have any immediate effect on industrial progress. And yet it is these very men that give strength to the sinews of a future generation, enabling it to keep its place in the industrial struggle of nations. Do not misunderstand me. Science never looks so beautiful as when she aids man to increase his resources and comforts; but the dove would not have brought the olive-branch to the ark of man's hopes unless she had been able to take a higher and a longer flight than that embraced in the tree whence she came.

It is no new truth that both abstract Science and Art should have a position intimately allied with, but still thoroughly independent of, Industry. I read mythology wrongly, unless this is strongly shadowed out in the history of the gods. Vulcan, the god of Industry, wooed Minerva with a passionate love, but the chaste goddess never married, keeping always independent, although no celestial ever showered so many benefits on the peaceful arts. Artistic beauty, in the person of Venus, was really

* "On the National Importance of Studying Abstract Science with a view to the Healthy Progress of Industry." By Lyon Playfair, C.B.F.R.S.—H. M. Stationery Office.

wedded to Vulcan, but this ill-assorted union was not a happy one, and Venus often repented the alliance.

Take the case of any philosopher, the most separate from human sympathies and enjoyments, and you will find that from him, though not through him, have sprung numerous appliances for their gratification. The very impersonification of abstract Science was Cavendish, as described by his biographer,* although fortunately for the world, such total abstraction from human sympathies does not frequently exist. "He did not love; he did not hate; he did not hope; he did not fear; he did not worship as others do. He separated himself from his fellow-men, and apparently from God. There was nothing earnest, enthusiastic heroic, or chivalrous in his nature, and as little was there any thing mean, grovelling, or ignoble. He was almost passionless * * * An intellectual head thinking, a pair of wonderfully acute eyes observing, and a pair of very skilful hands experimenting or recording, are all that I realize in reading his memorials. His brain seems to have been a calculating-engine; his eyes inlets of vision, not fountains of tears; his hands instruments of manipulation, which never trembled with emotion, or never clasped together in adoration, thanksgiving, or despair; his heart only an anatomical organ, necessary for the circulation of blood." Yet this man, destitute of passions and of sympathies, who durimg his body life, poured down light upon, without warming, the world—has by his mind, which still lives, conferred more real material benefit upon industry than any of the so-termed "practical" men who have succeeded him. His discovery of the composition of water has given to industry a vitality and an intelligence, the effects of which it would be difficult to exaggerate.

I have shown in my former Lecture, that a rapid transition is taking place in Industry; that the raw material, formerly our capital advantage over other nations, is gradually being equalized in price, and made available to all by the improvements in locomotion; and that industry must in future be supported, not by a competition of local advantages, but by a competition of intellect. All European nations, except England, have recognized this fact; their thinking men have proclaimed it; their governments have adopted it as a principle of state; and every town has now its schools, in which are taught the scientific principles involved in manufactures, while each metropolis rejoices in an Industrial University, teaching how to use the alphabet of Science in reading Manufactures aright. Were there any effects observed in the Exhibition from this intellectual training of their industrial population? The official reserve, necessarily imposed upon me as the Commissioner appointed to aid the Juries, need exist no longer, and from my personal conviction, I answer without qualification, in the affirmative. The result of the Exhibition was one that England may well be startled at. Wherever—and that implies in almost every manufacture—Science and Art was involved as an element of progress, we saw, as an inevitable law, that the nation which most cultivated them was in the ascendant. Our manufacturers were justly astonished at seeing most of the foreign countries rapidly approaching and sometimes excelling us in manufactures, our own by hereditary and traditional right. Though certainly very superior in our common cutlery, we could not claim decided superiority in that applied to surgical instruments; and were beaten in some kind of edgetools. Neither our swords nor our guns were left with an unquestioned victory. In our plate-glass, my own opinion—and I am sure that of many others—is, that if we were not beaten by Belgium we certainly were by France. In flint-glass, our ancient *prestige* was left very doubtful, and the only important discoveries in this manufacture were not those shown on the English side. Belgium, which has deprived us of so much of our American trade in woollen manufactures, found herself approached by competitors hitherto almost unknown; for Russia had risen to an eminence in this branch and the German wollens did not shame their birthplace. In silversmith work we had introduced a large number of foreign workmen as modellers and designers; but, nevertheless, we met with worthy competitors. In calico-printing and paper-staining our designs looked woderfully French; whilst our colours, though generally as brilliant in themselves, did not appear to nearly so much advantage, from a want of harmony in their arrangement. In earthenware we were masters, as of old; but in china and in porcelain our general excellence was stoutly denied; although individual excellencies were very apparent. In hardware we maintained our superiority, but were manifestly surprised at the rapid advances making by many other nations. Do not let us nourish our national vanity by fondly congratulating ourselves that, as on the whole we were successful, we had little to fear. I believe this is not the opinion of most candid and intelligent observers. It is a grave matter for reflection, whether the Exhibition did not show very clearly and distinctly that the rate of industrial advance of many European nations, even of those who were obviously in our rear, was at a greater rate than our own; and if it were so, as I believe it to have been, it does not require much acumen to perceive that in a long race the fastest-sailing ships will win, even though they are for a time behind. The Exhibition will have produced infinite good, if we are compelled as a nation to acknowledge this truth. The Roman empire fell rapidly, because, nourishing its national vanity, it refused the lessons of defeat, and construed them into victories. All the visitors, both foreign and British, were agreed upon one point, that, whichever might be the first of the exhibiting nations, regarding which there were many opinions, that certainly our great rival, France, was the second. Let us hope that in this there is no historical parallel. After the battle of Salamis the generals, though claiming for each other the first consideration as to generalship, unanimously admited that Themistocles deserved the second; and the world ever since, as Smith remarks, has accepted this as a proof that Themistocles was, beyond all question, the first general. Let us acknowledge our defeats when they are real, and our English character and energy will make them victories on another occasion. But our great danger is, that in our national vanity, we should exult in our conquests, forgetting our defeats; though I have much confidence that the truthfulness of our nation will save us from this peril. A competition in Industry must, in in an advanced stage of civilization, be a competition of intellect. The influence of capital may purchase you for a time foreign talent. Our Manchester calico-printers may, and do keep foreign designers in France at liberal salaries. Our glass works may, and do, buy foreign science to aid them in their management. Our potteries may, and do, use foreign talent both in management and design. Our silversmiths and diamond-setters may, and do, depend much upon foreign talent in art and foreign skill in execution; but is all this not a suicidal policy, which must have a termination, not for the individual manufacturer, who wisely buys the talent wherever he can get it, but for the nation, which, careless of the education of her sons, sends our capital abroad as a premium to that intellectual progress which, in our present apathy, is our greatest danger?

* "Life of Cavendish," by Dr. Wilson, p. 185.

Notice of an Indian Burying Ground.

BY EDWARD VAN COURTLAND, BYTOWN.

In the summer of the year 1843, whilst some workmen were engaged in digging sand for the mortar used in the construction of the piers of the wire suspension bridge at Bytown, suddenly came in contact with a number of human bones, and having been apprized of the circumstance, I lost no time in proceeding to the scene of their operations. A very little investigation served

to shew they had discovered an Indian burial-place. Nothing possibly could have been more happily chosen for sepulture than the spot in question, situated on a projecting point of land directly in rear of their encampment, at a carrying place, and about half a mile below the mighty cataract of the Chaudière ; it at once demonstrated a fact handed down to us by tradition, that the aborigines were in the habit, when they could, of burying their dead near running waters. The sand where these remains were discovered is of the very purest description, forming a superstratum of many feet thickness at its upper part, and gradually ending in a feathery edge over the fossiliferous limestone which constitutes the bed of the river. The very oldest settlers, including the Patriarch of the Ottawa, the late Philemon Wright, and who had located near by some thirty years before, had never heard of this being a burial-place, although Indians existed in considerable numbers about the locality when he dwelt in the forest ; added to this, the fact of a huge pine tree growing directly over one of the graves, was conclusive evidence of its being used as a place of sepulture long ere the white man in his progressive march had desolated the hearths of the untutored savage. The best portion of two whole days was spent by me at the diggings, and the fruits of my research were as follows :—One very large, apparently common grave, containing the vestiges of about twenty bodies, of various ages, a goodly share of them being children, together with portions of the remains of two dogs heads ; the confused state in which the bones were found, shewed that no care whatever had been taken in burying the original owners ; and a question presented itself, as to whether they might not have all been thrown indiscriminately in one pit at the same time, having fallen victims to some epidemic, or beneath the hands of some other hostile tribe ; nothing however, could be detected on the skulls, to indicate that they fell by the tomahawk, but save sundry long bones, a few pelvi, and six perfect skulls, the remainder crumbled into dust on exposure to the air. In every instance the bones were deeply coloured from the Red Hematite which the aborigines used in painting, or rather bedaubing their bodies, falling in the form of a deposit on them when the flesh had become corrupted. This material appears to have been very avishly applied from the fact of the sand which filled the crania being entirely coloured by it. A few implements and weapons of the very rudest description were discovered, to wit :—1st, a piece of Gneiss about two feet long, tapering, and evidently intended as a sort of war club ; it is in size and shape not unlike a policeman's staff. 2nd, a stone gouge, very rudely constructed of fossiliferous limestone, it is about ten inches long, and contains a fossil leptena on one of its edges ; it was used, as I lately learned from an Iroquois Chief, for skinning the Beaver. 3rd, a stone hatchet of the same material. 4th, a sandstone boulder weighing about four pounds ; it was found lying on the sternum of a Chief of gigantic stature, who was buried apart from the others, and who had been walled round with great care. The boulder in question is completely circular, and much in the shape of a large ship biscuit before it is stamped or placed in the oven ; its use was, after being sewed in a skin bag, to serve as a corselet, and protect the wearer against the arrows of an adversary. In every instance the teeth were perfect, and not one unsound one was to be detected, at the same time they were all well worn down by trituration, it being a well-known fact that in Council the Indians are in the habit of using their lower jaw like a ruminating animal, which fully accounts for the peculiarity. There were no arrow heads or other weapons discovered.

Canadian Institute.

At the Sixth Ordinary Meeting of the Canadian Institute, on Saturday, January 22nd, the following gentlemen were duly elected members of the Institute :

Christopher Robinson .... Toronto,

W. A. Baldwin .... Toronto,
F. Perkins .... "
J. G. Howard .... "
A. W. Simpson, } Junior Members .... "
G. H. Murrray, }

Professor Hind read a paper on the Geology of Toronto, illustrated by numerous specimens of fossils collected in the immediate neighbourhood of the city.

It was moved by Col. O'Brien, and seconded by Dr. Badgley and resolved :

"That the Council be recommended to take into their consideration the desirability, if not the necessity of obtaining a building not only fit for the requirement of the Institution as to its meetings, but also to the safe deposit of its specimens, and also to take such steps towards obtaining means as they may consider desirable."

SEVENTH ORDINARY MEETING, JANUARY 29TH

The following gentlemen were duly elected members of the Institute :

Peter McGill McCutcheon .... Toronto.
Maurice Baldwin, Junior Member .... "

Professor Croft signified his intention of presenting to the Institute a variety of Ornithological and Mineralogical specimens, as soon as proper cases were provided for their reception.

It was then moved by Professor Croft, and seconded by Prof. Cherriman, and resolved :

"That a Private Subscription be entered into by the members of this Institute, for the purpose of purchasing Glass Cases and other conveniences for the Museum.

The sum of £6 10s. was immediately subscribed by the members present.

Professor Cherriman read a paper on "Decimal Currency," which he was requested to publish in the Canadian Journal.

EIGHTH ORDINARY MEETING, FEBRUARY 5TH.

The following gentlemen were duly elected members of the Institute :

James Reekie, C. E. .... Quebec.
Hon. W. B. Richards .... "
Samuel Stratford, M. D. .... Toronto.
J. G. Valentine, C. E. .... Niagara.
E. Gainsborough Widnall, Junior Member .... Toronto.
Lewis Moffatt .... "
J. G. Worts .... "
H. P. Savigny, P. L. S. .... Barrie.

The President of the Institute read a paper on the "Windrose of Toronto."

NINTH ORDINARY MEETING, FEBRUARY 12TH.

The following gentlemen were duly elected members of the Institute :

John Arnold .... Toronto.
Henry Moyle .... Bradford.
William Sladden .... Toronto.
John Perram .... Tecumseth.

Donations by the President were then announced, of a Robe made from the skin of a White Carriboo, from the barren grounds,

District of Athabasca, and of some Fossil Shells (*auricula*) from St. Helena.

Also, donations by W. E. Logan, Esq., F. R. S., & G. S., late President of the Institute, of the Official Illustrated Catalogue of the Great Exhibition, and Hunt's Hand Book of the Great Exhibition.

Mr. Hirschfelder read a paper on Oriental Literature.

REVIEWS.

TORONTO HARBOUR.

1. *A Report by Walter Shanley, Esq., C.E. Toronto, January 2nd,* 1853.
2. *A Report by Sir R. Bonycastle,* 1843.
3. *A Paper read by Sandford Fleming, Esq., C.E., before the Canadian Institute. Toronto, June 1st,* 1850.
4. *A Supplementary Paper read by S. Fleming before the Canadian Institute. Toronto, March* 22, 1851.
5. *A Letter (published in "The Patriot,") signed "Kivas Tully." Toronto, February 10th,* 1853.

"In a multitude of Councillors there is (or ought to be) wisdom." Mr. Shanley's Report, lately published, has had the effect of directing general attention to the condition of the Toronto Harbour, upon the efficient maintenance of which undoubtedly depends the Commercial character and prosperity of the city. The subject is one, therefore, of very general interest; and as, in an engineering view, it is moreover admitted to be one of very great difficulty and danger, it is of importance that opinions given authoritatively should be subjected to rigid scrutiny and frank reviewal. If we should find it necessary to dissent from the views of the authors of the above papers, they must remember that those views have by their own acts become public property, and that the higher the source from which they have emanated, the more worthy are they of criticism, even though it be adverse. Everybody who knows Toronto, knows the Peninsula by which its bay is nearly enclosed. Approach the city by water, from what point he may, the stranger's eye rests upon this curiously shaped spur; and as he quickly discerns its sheltering properties, and to it attributes the excellence of the haven, so charmed is he by the stillness of the waters within, and so satisfied is his mind by the contemplation of an evident security, that he generally fails to lament the narrowness of the entrance, or to speculate upon the theory of that formation which is the cause of it. Some there are, of course, who, like Mr. Shanley, "standing on the deck of a steamer," or "looking from the shore," have noticed "the plainly defined outlines of the bar," which, alas! it requires not "the eye of an engineer" to discover. Nay. some grumbling and visionary alarmists have been looking at it these twenty years past; and although indulging in fearful predictions in regard to its future, (in which they have been supported by engineers, surveyors, et hoc genus omne, from the time of General Simcoe to the present day) have failed to obtain a hearing, far less to induce a belief. "Truly," have exclaimed these disappointed savans "men are no prophets in their own country!" and therefore, when Mr. Shanley asserts that his acquaintance with the locality has been "short," and that his knowledge of it is that of "a stranger," he takes his course with the acuteness common to his countrymen, and "goes in to win" on the acceptation of the same old proverb, extended to a belief in prophets from afar.

Before attempting to prescribe a remedy, engineers, like physicians, generally endeavour to ascertain the cause of the evil; and having satisfied themselves that the root and manner of its action have been discovered, they proceed to apply those preventive or remedial measures which they believe to be suited to the case; but of course if the premises be erroneous the deduction will be false, and the applications made upon it will very probably be unsuccessful.

This gives great importance to the inquiry, "How has this peninsula been formed, and to what causes may the prolongation of the bar at its western extremity be ascribed?" Upon a clear and satisfactory determination of these points probably depends the efficiency of the remedial measures; in its absence any measures so intended can but be experimental, and may be worse than useless.

Prior to 1850, four different theories of formation had been proposed, which we find thus enumerated in Mr. Fleming's paper of that year:—

1. That the Peninsula is an accumulation of drift, carried across the lake by the current of the Niagara River.

2. That it has been formed, and that the shoal at the entrance of the harbour is now in process of extension, by the influence of the opposing currents of the Don, and the more westerly rivers, *in contact*, and the deposition of matter on the neutral line between them.

3. That it is a ledge of the rock underlying Toronto and the lake, forming a check for the deposition of, and now covered with alluvial matter.

4. That it is a deposition of the Tertiary period. And,

5. That it is jointly a delta of the Don, and a drift from the eastward.

The first of these propositions may briefly be dismissed as untenable: the third is at variance with the general Geological features of the locality, and has been disproved by investigation; and the fourth is that suggested by Sir Richard Bonycastle, who states his belief "that the Peninsula is one of the many ridges deposited at the bottom of a vast lake, which existed before the present Ontario and Erie were formed out of its drainage," "and that it had probably not changed its form or character since it emerged from the waters." Now, by reference to the papers and charts in the possession of the Canadian Institute, we find, that since Bonycastle wrote, not only has the general outline of the Peninsula been very considerably altered and extended, but that at one particular point an area of upwards of thirty acres has been added to that previously within the shore line; and as this recent addition is in geological character a perfect fac-simile of the portions anterior to it, we may infer that both are due to the same causes, and traceable to the same source, and therefore that the Peninsula is a formation of the present epoch, and not a diluvian deposition.

The second proposition is that which has found a supporter in Mr. Shanley, who after stating that "on looking from the shore, when the waters were beginning to be ruffled by a coming gale, or subsiding into a calm after one, he has frequently viewed, with an engineer's eye, the plainly defined outline of the bar, indicated by a white muddy streak, whilst the waters on either side of it were clear and uncoloured,"—proceeds to record his opinion that "the sandbank is simply the accumulation of the deposit brought down year after year by the Humber, the Etobicoke, the Credit, the Sixteen, and other streams discharging into the lake above this city; all of which are subject to great and sudden freshets, the discoloration of their waters at such periods indicating that they are surcharged with the debris of the regions they have traversed, and which, held for a time in suspension in the lake, is by the prevalence of south-westerly winds, drifted down and finally precipitated along the 'peninsula' which forms the southern shore of the bay, and over the still submerged bar, which is fast becoming its Western one."

"To the effect," he continues, "of the counter currents, caused by the prevailing winds down the lake, and the River Don, discharging its waters in a contrary direction, I believe to be due the origin of the Peninsula which encloses the bay, the precipitation of the suspended matter naturally taking place on the neutral line between the conflicting currents; and so well assured do I feel that this vast accumulation

of deposit is mainly attributable to the action of the above-named streams, that it would surprise me much if a scientific examination of the bar should fail to prove the particles entering into its composition to be representatives in minature of the same geological formation as obtains along and below the Flamborough Heights."

In this proposition, then, Mr. Shanley first declares that "when the waters are beginning to be ruffled by a coming gale, or subsiding into a calm after one, "the bar is denoted by a white muddy streak," with the water on either side of it *clear and uncoloured.*" Now we presume, that as "the discoloration of the waters of the Humber and other westerly streams "indicates that they are surcharged with the debris of the regions they have traversed," the absence of this discoloration on the margins of the bar (and especially under the circumstances stated) would appear to denote that such debris has not been carried thence, and by those waters, for how could "the waters on either side" remain, even during a gale, in a translucent state, if at the same time they were the vehicle of transportation for the discolouring matter referred to, and in other places so apparent? But in the process of such a transportation, a distance varying from *five to twenty miles,* with a depth of water varying from *sixty to one hundred feet,* are involved; and it seems very questionable, if it may not be stated as an impossibility, that the materials of which the Peninsula is formed (*sand and gravel*) could for such a distance, and over such a depth of comparatively still waters, be "held in suspension, and drifted down" to their present position. Were the deposit of an argillaceous nature, and did the winds prevail from the south-west, there might be some grounds for such a supposition; but as neither of these is consistent with fact, we conceive there are none.

Again, in a subsequent paragraph (and after having attributed the bar to "the effect of *the counter currents* of the lake and the River Don") Mr. Shanley says, whilst the lake and its tributaries are united in blockading the entrance of the Port, there is a less potent but insidious and patient enemy busy at its Eastern extremity—the River Don." "Doubtless the evils to be apprehended from the action of this stream are *distant and insignificant;* * * * but having more than once heard the opinion expressed, that an effect beneficial to the channel, in aiding to keep it unobstructed, is due to the influx (we presume *ef*flux is intended) of the Don water, I wish here to record my dissent from such opinion, being convinced that * * * *the outward currents which do exist at seasons, are to be traced to an entirely different source.*" Now, the Don seems to be a very fickle or very accommodating River. First we have its current conflicting with the lake waters at the bar, *and thus forming it,* and then we have it insidiously retiring to "the eastern extremity of the bay" and "busy" in another service: first, it is described as "discharging its waters "at the bar," in a contrary direction" to that of a south-westerly wind, and immediately afterwards, "the outward currents are attributable to an entirely different source!" Far from attempting to disentangle this mystery, we shall not even essay to determine which "current" of this "conflicting" argument is the true one. Indeed, we are inclined to doubt both, for if the outward current be not due to the Don, it must, we suppose, be due to the wind; and if to the wind, inasmuch as its influence would be common to both currents, simultaneously impelling them in the same direction, there could be no "conflict." A wind driving the Lake waters west, would drive the Bay waters out, and westerly; whilst a wind impelling the Lake waters east, would drive them into the Bay, and thence easterly. We cannot understand the proposition, and should be glad to see it explained.

But it is said that "the conflicting currents" (we mean of the waters, not the argument) result in "a neutral line, where the precipitation of the suspended matter actually takes place." One current, however, that of the Don, has been unceremoniously dismissed to "the eastern extremity of the bay," and the other, and that the most potent, is attributed to the influence of the south-west, which is certainly not the prevailing wind: as surely therefore as the wind changes, the neutral line between the two currents (for we must recall the Don to get the conflict) changes with it, and hence the precipitation is distributed far and wide,—or is chiefly in the line of the prevailing wind, and therefore not where it is said to be.

There are other and very cogent reasons, inducing us to doubt that the peninsula is the deposit of the streams to the westward, or (as Mr. Shanley suggests) "the geological representative in minature of the Flamborough heights." We believe the Peninsula to be, in superior geological formation, the representative of the *Scarborough* heights; and if so, then undoubtedly it is a deposit from *the eastward,* brought, not as Mr. Shanley says, by the River Don, for that would involve a geographical impossibility, but by the lake waters, under the influence of south-easterly gales. And again, before the commencement of such a deposition as that suggested from the west, the Don, it is fair to infer, must have had a free run into the lake; when therefore it conflicted with a stronger current from the west, it must have been turned easterly; and as the neutral line would of course take the same direction, the deposition would have been easterly also. Now, the current of the Don outwards has been turned westerly, and the deposition, it is admited, has been and still it westerly; it is reasonable to conclude, therefore that the strongest lake currents have been from the east—and if from the east, then undoubtedly the Peninsula cannot be a deposit from the westerly streams. Besides, to suppose that the deposit has been from the west, is to suppose either that the two currents first met at the bar, and that the deposition has been *thence easterly,* or that they met at the eastern limit of the peninsula, and that the deposition has been *thence westerly,* in the teeth of the strongest current: but the former is contrary to fact, and the latter an impossibity: we have therefore to account in some other way for this formation and its progress.

And this brings us to the fifth proposition in Mr. Fleming's list, and to the consideration of his papers named in our heading.

Mr. Fleming contends that the peninsula is jointly a delta of the Don and a drift from the eastward. This theory he has propounded after a very complete, and apparently a very accurate instrumental survey of the bay and the peninsula, including soundings within and without, and sections from various points of the city front, on lines southerly through the bay and peninsula to the lake. He has moreover transferred, from charts of various dates, the form and condition of the peninsula, by which, in connection with his own more recent surveys, he professes to elucidate the manner of its extension, and to these he has appended charts of the other natural harbours of our lakes where, in his opinion, the same agencies have been exercised to a similar result.

Many of our readers will remember the occasion on which these papers were exhibited some two years since. The authorities of the city—the Mayor, and members of the Corporation, the Harbour Commissioners, and others officially interested in the subject, were invited to be present, and some of them did attend the reading of the papers, and the discussions which ensued upon them, in the rooms of the Canadian Institute. We think we are correct in saying, that the general impression then was that Mr. Fleming had succceeded in establishing the truth of his propositions; at any rate it is certain, that the valuable information, which, he had collected, was acknowledged to have given the first practical direction to this important enquiry. Our limits will not permit us to make any very lengthened reference to Mr. Fleming's labors, nor is it necessary, as in combating Mr. Shanley's views, we have in a great measure adopted those of Mr. Fleming. He contends that the groundwork of the peninsula was a delta of the Don, formed on the subsidence of Lake Ontario from a high to its present level, and the consequent scour of the region now represented by its valley:—that this delta has afforded a base for the drift from the highlands of Scarborough, which formerly occupied a much more southerly position than at present; and that under the influence of the south-westerly gales, it has continued to augment, the deposition being westerly, until, in

approaching the open waters of the Humber Bay, its course has been turned towards the north.

The direction in which the drift is moved by the waves, is subject, of course, to the direction of the wind; and the quantity moved bears intimate relation to the force of the waves, which with winds of equal velocity are again dependent for their power upon the area which they traverse. Now we know it is beyond dispute, 1st, that the prevailing wind of Lake Ontario mainly affecting its north shore is from the south-east; and 2ndly, that the greatest extent of water over which any wind impinging on the north shore of the lake can traverse, is also south-easterly, so that inasmuch as the formation of the peninsula is identical with that of the Scarborough Heights, and the prevailing and most powerful winds precisely those which would carry the drift thence to the peninsula, we have very strong grounds for concluding that to those influences its formation may be ascribed. But further, if we recur to the principle upon which Mr. Shanley rests his argument, that of a neutral line between two conflicting currents surcharged with debris, we shall find that it may be applied with more consistency in aid of this than of any other hypothesis: for let us again premise that the original run of the Don waters was free into the lake and nearly (as the outlet of the stream still denotes) at right angles with the shore, then they have impinged upon the lake waters at a point opposite the outlet, and under the influence of the prevailing and the most powerful winds have been turned westerly. The neutral line would of course take the same direction, and on it the deposition alike of the debris from the Don, and the drift from Scarborough would take place, until by that deposition the currents would be divided, the neutral line lost, but a base be formed upon which the extension of the peninsula would result in a westerly direction, and by the drift alone. In these suppositions there is nothing inconsistent with the ascertained facts of the case: indeed we find that the surface of the peninsula is composed of a succession of ridges, all starting from the east, in curves adjacent and tangential, or nearly so, to the line of the south shore, but spreading and pointing towards the north-west: an effect clearly of the south-east wind, and proving that much is due to its greater power and prevalence.

Believing, then, that the formation has been and still is, mainly, if not altogether, from the Eastward, we might proceed to discuss the propriety of the measures suggested in view of the preservation of the Bay Channel from further encroachment. But, we have already said that, "if the premises be erroneous, the deduction must be false," and as the application of that law is common to all arguments, it may perhaps be better not to extend the criticism to those practical measures which we are inclined to think have been suggested in the absence of that full knowledge of the local conditions, under which alone works of so important a character can be prudently undertaken. We cannot, however, conclude without briefly expressing our regret, that in such a case (it matters not from whence the evil comes) the Dredge should be referred to as *a permanent necessity*, for in that view it generally has been, still is, and we think, always should be, the dread of an Engineer. Always a costly expedient, in harbour channel works—except as the remover of some standing and purely local obstruction,—the pioneer of a scour,—or of some equally permanent remedial or preventive power,—it is temporary in its results, endless in its application, and accordingly the *dernier resort* of the Engineer. It is often easier and more economical, *always* more satisfactory, to divert a drift than to remove it; and he must be a patient practitioner indeed, who, having dredged a bar, stands by during the deposition of its successor to renew the process.

In the heading to this review, we have named Mr. Tully's "Letter" as being one of the documents recently submitted on the subject; as, however, the consideration of the others has more than covered the ground which it occupies, and as in relation to the formation of the Peninsula, it professes no novelty, we shall refrain from any special notice, and merely express our satisfaction that this question has at length forced itself upon public notice, and attracted even gratuitous enquiry amongst professional men.

Journal of the Society of Arts and of the Institutions in Union.—George Bell, *London.*

This Journal is a record of the proceedings of the Society of Arts and of the Institutions in union with that body. Its objects are so fully and explicitly detailed in the subjoined introduction to the first number, which appeared November 26th 1852, that we cannot do better than transcribe it in full:

"The rapid increase which, during the last few years has taken place in the business of the Society of Arts, has rendered it necessary for the Council to make a complete change in the mode of publishing the Society's weekly proceedings, which have, in fact, hitherto contained little more than a condensed account of the papers read at the weekly meetings, and such routine business as from time to time came before the Society. As, however, from the greatly enlarged range of subjects which at present occupy the attention of the Society, and from the many important inquiries which its members are prosecuting, the mere weekly transactions evidently constitute but a small part of the useful labours of the Society, it has been deemed necessary by the Council, to adopt such changes in the weekly publication of the Society as should render it not merely a record of the proceedings at the Wednesday Evening Meetings, but, in fact, a regular and systematic Journal of the various great and interesting undertakings which the Society is, at present, actively carrying on.

Ever since the Council determined to dis-continue the publication of a yearly volume of Transactions, the want of a Journal has been felt and acknowledged, and it has been evident that the printed weekly proceedings did not sufficiently meet this requiremet, neither serving as a register of the various important subjects brought before the Society, nor yet even as a means of making the members themselves conversant with the numerous investigations and inquiries carried out by the Committees of the Society. In determining to publish an extended weekly journal, the Council are guided by the fact that while such a paper will prove a more satisfactory means of communicating to the members, and also to the public at large, the proceedings of the Standing Committees, of the Colonial and Foreign Committees, and of the Provincial Institutes Committee, it will, at the same time, also become a means of materially assisting those Committees in the various important matters under their consideration. In no department of the Society's labours, will the new Journal be more useful, than in connection with the General Union of Literary, Scientific and Mechanics' Institutes just formed, and which already numbers 225 institutions in all parts of the Empire, including, in the whole, upwards of 90,000 members. It will be obvious that the Journal will supply a medium of communication with the members of these institutions, and will offer facilities in the way of correspondence between them and the Society of Arts, far beyond any mere system of correspondence by letter. This, whilst it will diminish the labour of the Committees of the Society, will, it is hoped, at the same time, greatly increase their power of usefulness.

It is only necessary at present further to state, that the Journal will be conducted by the Secretary, under the immediate control of the Council; that, under proper regulations, its pages will be open to contributions on all subjects connected with the progress of human industry, and the encouragement of arts, manufactures, and commerce and that, as far as may be found to be practicable, it will, in addition to the proceedings of the Society of Arts, and the Institutions in Union with it, contain brief notices of the proceedings of other similar societies, and in general, of all matters of scientific or technical interest. The Council, however, will only consider themselves responsible for as much as is signed by their Secretary by order."

A very numerous list of subjects for Premiums is given in the third and succeeding numbers of the Journal, some of which are both interesting and important to Canada, and will probably elicit information on the topics to which they refer. The Council state that in publishing the List of Subjects for Premiums for the Session of 1852-3, they desire to indicate some of those subjects of inquiry which are considered as peculiarly deserving of attention, and for which therefore they offer premiums. The object of the Society has always been to encourage useful inventions, and communications relating to any department of Arts, Manufactures, or Commerce, are received and always meet with due attention; a premium or other reward being given in those cases where the communication is deemed of sufficient value or importance. In the following List of Subjects, which includes the first division of the Prize List, each article is followed by a brief

note intended to explain more in detail, the object proposed in offering the premium :

1. For the discovery in England, or the importation from any of the British Possessions, of Plumbago, or of some other substance which may be used in lieu thereof, equal in quality to that now obtained from Cumberland.

The use of plumbago is greatly on the increase, whilst the supply appears rather to diminish.

2. For the best sample of any new Ornamental Wood, suitable for the manufacture of furniture.

New Zealand has already furnished some excellent specimens of woods, which have been applied successfully for this purpose. The vast, unexplored tracts of Australasia and Canada, give promise, from what we already know of them, that many valuable woods may also be obtained from those quarters.

3. For the importation of not less than one ton of the Galium Tinctorium from Canada.

This root is stated to yield a very fine flesh lake. Although imported into this country many years since, it has not yet become an article of commerce. This may, perhaps, be due to a deficiency in the mechanism for extracting the colour, or possibly to an ignorance as to the value of the root on the part of the natives themselves.

4. For an account of recent American Inventions, having for their object the substitution of mechanical processes for manual labour in the household and domestic arts.

Many of the useful, though apparently unimportant contrivances, in common use in the States, for facilitating, or altogether dispensing with manual labour and attention, might, it is believed, be imported hither with advantage. Even if not applicable to home purposes, they would certainly be of considerable service to emigrants.

5. For the production of Castings in Iron, equal in sharpness and in delicacy of surface to those now imported from Berlin.

It is said, that the great cause of the superiority of Prussian and Swiss fine-art castings, is attributable to some peculiarities in the sand used in forming the moulds.

6. For the best, simplest, and most economic Flour-mill, for the use of Emigrants and Settlers.

The extension of civilization, the subsequent centralization of all manufactures and the division of labour which this has led to, have induced the construction of powerful machinery applicable to the preparation, on a large scale of the food of man. But the simple and primitive methods used by our forefathers, have been altogether overlooked. The production, therefore, of a simple portable, efficient, and inexpensive mill, which shall be capable of grinding and dressing the emigrant's meal, placed as he is in a somewhat similar position, is a point worthy the attention of our mechanists.

SCIENTIFIC INTELLIGENCE.

A Problem Solved.—What to do with the refuse of our alkali works, has long been a perplexity. Not being an article of commerce, it was a "growing evil;" but Dr. Glover, we are told, has in some measure solved the difficulty. He saw that, if not of value as cargo,—if ships would not take it away in their holds,—it might be applied externally to their hulls. He has had it converted into a pigment for iron ships, anti-corrosive, and repellant of barnacles and weeds. If the ingenious device should be found to answer, the doctor may be congratulated on having conferred a great boon on our chemical works and our shipping.—*Gateshead Observer.*

Declivity of Rivers.—A very slight declivity suffices to give the running motion to water. Three inches per mile in a smooth, straight channel, gives a velocity of about three miles an hour. The Ganges, which gathers the waters of the Himalaya Mountains, the loftiest in the world, is, at eighteen hundred miles from its mouth, only about eight hundred feet above the level of the sea; that is, about twice the height of St. Paul's Church in London, or the height of Arthur's Seat, near Edinburgh; and to fall these eight hundred feet, in its long course, the water requires more than a month. The great river Magdalena, in South America, running for a thousand miles between two ridges of the Andes, falls only five hundred feet in all that distance. Above the commencement of the thousand miles it is seen descending in rapids and cataracts from the mountains. The gigantic Rio de la Plate has so gentle a descent to the ocean, that in Paraguay, fifteen hundred miles from its mouth, large ships are seen, which have sailed against the current all the way, by the force of the wind alone; that is to say, which, on the beautifully inclined plane of the stream, have been gradually lifted by the soft wind, and even against the current, to an elevation greater than that of our loftiest spires.—*Arnott's Physics.*

Coating Iron with Copper.—A patent has been granted to Theodore G. Bucklin, of Troy, New York, for a new and improved mode of coating iron with copper, which promises to be an invention of no small importance to the arts. It has long been a desideratum to coat iron with some other and less oxidizable metal, in order to render it more durable in exposed situations. It is more essential to have sheet and plate-iron than any other kind covered with copper. For example, sheet-iron covered with copper would be cheaper than tinned iron for roofs of buildings, &c.; and plate-iron, if covered with copper, would be excellent for making steam-boilers so as to prevent incrustations, &c. Cheapness is an important item in the process. If the process is expensive, then it can be of no general benefit, for pure copper would be preferable; if cheap, it is a most important discovery. A method of covering iron with brass, copper, &c., has long been known; but to cover it and make the copper unite with the iron, like tinned iron, has hitherto been considered problematical. The invention of Mr. Bucklin promises to fulfil every condition desired in making copper iron. Cast, malleable, and wrought-iron can be coated with copper by the new process. The process consists in first removing the oxide from the iron to be coated, then covering it with a medium metal which has a great affinity for the iron, and afterwards dipping the iron so prepared into molten copper, which, by the galvanic action of the medium metal, makes the copper intimately combine with the iron, and form a complete coating. The oxide is removed from iron by means of diluted sulphuric acid, in which the castings or sheets are rubbed with sand; after this they are washed and dipped into a solution of the muriate of ammonia dissolved in a suitable vessel, when they are ready for the next process. This consists in dipping the sheets or plates into molten zinc, immediately after they are lifted out of the sal ammoniac solution. The surface of the molten zinc should be covered with dry sal ammoniac, to prevent the evaporation of the metal. The iron is soon covered with a coating of zinc, and forms what is termed galvanized iron. At hand the operator has a crucible or pot containing melted copper covered with some incombustible substance as a wiper, and he at once dips the zinced iron into this, in which it is kept until it ceases to hiss, when it is taken out and found to be covered with a complete and durable coating of copper. By dipping the iron thus coppered into the solution of sal ammoniac, then into the zinc, and the copper—repeating the process—coat upon coat of the copper will be obtained, until acquires any degree of thickness. The black oxide is prevented from forming on the copper by dipping it afterwards in the salammoniac solution, and then washing it in pure water. This process is entirely different from that of Mr. Pomeroy, for which a patent was granted a few years ago. We have seen samples of iron coated by Mr. Bucklin's process, which were very beautiful and well covered. Unless the melted copper was covered with a non-combustible substance, the plates would come out in a very rough state; but the covering acts as a wiper, and the coppered plates come out smooth and well coated. Brass, or any of the copper alloys, can be made to coat the iron, in the same manner as the copper. We hope this new process will be the means of extending the use of sheet-iron, so as to save considerable to the country that is now paid out for tinned sheets. —*Scientific American.*

Manufacture of Gas from Wood.—Two years ago, Dr. Pettenkofer showed by experiment, at a meeting of the Polytechnic Institute of Bavaria, that a very considerable amount of illuminating gas could be disengaged from 2 ozs. of wood. The inventor's process is now in operation at Basle, and is also about to be introduced at Zurich, Stockholm, and Drontheim. The process is said to be far less expensive than the manufacture from fossil coal, and furnishes a gas which is free from sulphuretted hydrogen, and several useful collateral products, as charcoal, wood-tar, and wood-vinegar.—*Central Blatt.*

New Art of Ornamenting Metallic Surfaces.—Numerous as are the inventions or methods which have been applied for the ornamentation of metals within the last few years, we are not aware of any which, for simplicity and beauty, at all equal that recently invented and patented by Mr. R. F. Sturges, of Broad-street, Birmingham. It affords the means of decorating plain surfaces of objects formed of metal, at a reduction of cost which throws all other processes, devised or invented, into the shade, while, at the same time it materially improves their appearance. The invention depends upon the compression of a material between two or more plates of metal in the operation of rolling. It may astonish our readers to learn that the most delicate thread lace, such as is used in ladies' attire, perforated paper, or wire webbing, when passed through a pair of rolls, leaves an impression upon the sheet of metal, corresponding in depth to the compressibility of the material used as a pattern, and the density of the metal upon which the pattern is required to be impressed or indented. In various articles in electro-plate, Britannia metal, &c., such as those used for all ordinary purposes, it is equal to the much more expensive process of decoration by engraving.

Purification of Naphtha and Preparation of Naphthaline.—Mr. Whitesmith (Glasgow), suggests the following method of purifying coal-

naphtha, so as to fit it for preserving potassium :—Take a considerable quantity of the best rectified coal-naphtha, and about ten per cent. of concentrated sulphuric acid. Keep them in contact, with frequent agitation, for three or four days. Decant the naphtha, and add fresh acid, repeating the same process several times. The naphtha, which is now of a deep colour, with an acid reaction, and most pungent odour, is distilled very gradually, and neutralized by a current of dry ammoniacal gas passed through it. It is then repeatedly distilled, rejecting the last portions. Thus, it finally appears as an exceedingly mobile limpid fluid, of a pleasant odour, and is perfectly adapted for preserving potassium. To obtain naphthaline, mix common bituminous coal in fine powder with an equal quantity of quick-lime, put the mixture in a small tin-plate still, and heat over the gas furnace for about an hour. On afterwards opening the still, naphthaline will be found deposited inside the head.—*Artizan.*

Canadian Shipping.—In the annual circular issued by Messrs. Tonge & Co., of Liverpool, on the Shipping Trade of 1852, we are glad to notice the subjoined testimony of the progress made by the Quebec Shipbuilders in their highly important brance of Art and Industry :—"We have much pleasure in noticing a marked improvement, both in the model, material and finish of Canadian Ships, the majority of which have been constructed to class six or seven years, and to which a decided preference is given by buyers over the spruce ships, or those classing but four or five years, even at a very increased price. Among those which have arrived within the last eight months, will be found some, as fine models of naval architecture, as ever have been produced, combining in reality, (from having great length of floor and fine ends) both carrying and sailing properties, of no ordinary kind.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—January, 1853.

Latitude 43 *deg.* 39.4 *min. North. Longitude,* 79 *deg.* 21 *min. West. Elevation above Lake Ontario :* 108 *feet.*

Magnet	Day.	Barom. at tem. of 32 deg.				Temperature of the air.				Tension of Vapour.				Humidity of Air.				Wind.			S'nw in Inch.	Rain in Inch.
		6 A. M.	2 P. M.	10 P. M.	MEAN.	6 A. M	2 P. M.	10 P. M.	M'N.	6 A. M.	2 P. M.	10 P. M.	M'N	6 A. M.	2 P. M.	10 P. M.	M'N	6 A. M.	2 P. M.	10 P. M		
						°	°															
bc	1	29.526	29.684	29.784	29. 691	23 2	26.9	21.2	23.47	0.110	0.129	0.110	0.114	85	87	94	88	N	NW b N	NW b N	- -	- -
b	2	.776	.685			23·4	31.4			.109	.140			84	79			W b S	N E	E b S	- -	- -
bc	3	.660	.697	.882	. 768	26 9	25 4	18.3	22.95	.129	.117	.086	.106	87	84	82	83	NE b N	N b E	N b E	- -	- -
a	4	.915	.914	.937	. 924	11.6	18 3	10 9	14.45	.069	.072	.063	.073	89	70	86	82	N b E	N b W	NN W	- -	- -
c	5	.900	.792	.656	29. 769	7.1	23 3	18.7	16 03	.058	.114	.083	.080	90	88	78	86	N	S W	SW b W	- -	- -
c	6	.602	.437	.425	. 503	25 8	31.2	21.6	27.97	.126	.149	.101	.132	88	84	84	84	SW b W	S W	S S W	- -	- -
c	7	.482	.615	.768	. 637	29.8	38.4	27.2	30.95	.143	.170	.130	.164	87	73	86	84	S W b S	S W b S	S W	- -	- -
cd	8	.794	.706	.604	. 696	21.6	36 0	35.0	31.77	.101	.196	.188	.168	81	93	93	92	NE b N	E b N	E N E	- -	0.290
cd	9	.578	.723			36.3	40 9			.197	.178			93	70			S W b W	W S W	Calm.	- -	- -
c	10	.690	.752	.813	. 777	24.1	37.4	32.4	32.33	.113	.177	.171	.165	85	79	94	89	W S W	S S W	S S W	- -	Inap
a	11	.895	.950	.976	. 948	34.5	33 8	30 7	32 55	.169	.121	.153	.146	85	62	89	79	N b W	N E	N E	- -	- -
c	12	.973	.922	.925	. 938	22 3	24.1	17.7	21.08	.110	.059	.088	.086	88	45	86	75	N E	E N E	N E	0.4	- -
c	13	.893	.865	.872	. 879	20 2	26 0	23.7	23.47	.100	.084	.116	.105	89	59	88	81	N E	E N E	N E	0.5	- -
c	14	.856	.810	.816	. 830	23.6	28.0	27 3	26.52	.116	.135	.133	.127	88	87	88	87	N E b N	N b E	N b E	0.4	- -
a	15	.731	.676	.809	. 752	29.1	31.2	10.1	21.40	.142	.117	.058	.117	88	67	78	79	SW b W	NW b N	N W b N	Inap	- -
b	16	.945	.963			–6 6	4.7			.024	.050			65	85			N W b N	NW b N	N N W	- -	- -
b	17	.910	.807	.637	. 784	5.0	18.0	13.9	12.38	.048	.032	.070	.067	81	80	80	80	W b N	N W	N b E	- -	- -
c	18	.658	.673	.799	. 716	14.4	20 2	18 3	17.62	.079	.081	.091	.084	89	72	83	84	N b E	N W b N	N b W	- -	- -
a	19	.891	.890	.839	. 859	18.0	24 9	25.9	23.12	.084	.102	.113	.102	82	75	79	80	N W b W	N W b W	SW b W	- -	- -
ac	20	.694	.462	.528	. 557	24 4	32.9	25 8	27.97	.113	.132	.118	.124	84	70	82	79	W S W	S W	W b S	- -	- -
b	21	.632	.634	.595	. 621	18.7	31.1	27.9	25.67	.087	.161	.135	.122	82	81	88	84	W b S	S S W	S S W	- -	- -
a	22	.523	.428	.324	. 411	19.7	37 0	28.7	28.05	.094	.167	.143	.134	85	77	90	85	S S W	S S W	S S W	- -	- -
b	23	.050	28.788			30 9	31 0			.157	.185			92	95			N N E	E N E	N	4.0	Inap
b	24	28.665	28.880	29.160	28. 922	33.2	29.7	19.4	27.08	.167	.112	.077	.120	88	67	71	78	N b W	N W b N	N W b W	2.0	- -
b	25	28 889	28.991	29.174	29. 036	27.5	13.6	9.7	16.27	.145	.061	.062	.086	96	71	85	82	S S W	N W b N	N W	0.2	- -
a	26	29.559	29.780	29.876	29. 768	-0 3	4.0	7.5	3 72	.035	.046	.044	.042	76	81	66	75	N W	W N W	SW b W	- -	- -
ac	27	30.059	30 180	30.315	30. 187	12.7	19 7	10.5	13.72	.065	.076	.057	.065	79	70	77	75	SW b W	W S W	Calm	- -	- -
b	28	30.293	30 220	30 136	30. 211	10.0	27.9	21.0	18.25	.062	.104	.094	.084	83	67	81	79	N W b W	S W	S W b S	- -	- -
a	29	30.006	29 630	29.421	29. 657	11.1	35 7	33.0	27.47	.074	.170	.171	.140	97	82	91	89	S W b S	S b W	W S W	- -	- -
c	30	29 496	29 687			35·9	29.5			.146	.094			69	57			N W b W	N W	Calm	- -	- -
b	31	29.690	29 532	29.826	29. 666	22.6	33.6	28.4	31.13	.105	.179	.116	.137	84	77	73	77	Calm.	S b W	E N E	- -	- -
	M	29 703	29 691	29. 727	29 7121	19 88	27 55	21.72	22 98	0.102	0.120	0.107	0.111	86	75	84	82	Ml's 5.69	Ml's 7.75	Ml's 5.83	7.5	0.290

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
2472.69	1911.13	800.84	1064.17

Mean velocity of the wind - - 6 34 miles per hour.
Maximum velocity - - - - - 25 3 ml's per h'r, from 11 a.m. to noon 25th.
Most windy day - - - - - 24th : Mean velocity, 13.53 miles per hour.
Least windy day - - - - - 10th : Mean velocity, 1.40. ditto.
Most windy hour - - - - - noon: Mean velocity, 8.37 ditto.
Least windy hour - - - - - 9 ,p.m.Mean velocity, 5.20 ditto.
Mean diurnal variation - - - 3.17 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows :—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 30.315, at 10 P. M., on 27th } Monthly range:
Lowest Barometer - - 28.653, at 4 A.M., on 24th } 1.662 inches.

Highest observed Temp. - 40 9, at 2 P. M., on 9th } Monthly range:
Lowest regist'd Temp. - —9.7, at A.M., on 19th } 50.6
Mean Highest observed Temperature - - 29.04 } Mean daily range:
Mean Registered Minimum - - - - - 14.89 } 14.16
Greatest daily range - - - - - 40.9 from 2 P.M.,on15th to A.M., of 16th.
Warmest day - - 11th - - - Mean Temperature - 32 55 } Difference:
Coldest day - - - 26th - - - Mean Temperature - 3.72 } 28.83

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for January.

Ye'r	Temperature.				Rain.		Snow.		Wind. Mean Velocity.
	Mean.	Max.	Min.	Range.	D'ys	Inches.	Dy's	Inch.	
	°	°	— °	°					
1840	17.02	40.6	13. 8	54.4	4	1.395	11	not regis'd	Miles.
1841	25.11	41.7	— 4. 1	45 8	2	2.150	14		--
1842	27 54	45.8	1. 3	44.5	5	2.170	9		--
1843	28.46	51.4	1. 5	52·9	6	4.295	12	14.2	--
1844	19 95	45.6	— 7. 7	53 3	7	3.005	11	24.9	--
1845	23.26	43.0	— 3. 4	46.4	5	imperfect	9	22.7	--
1846	26.11	41.2	0. 3	40.9	5	2.335	10	6.0	--
1847	22 88	42 6	— 2. 2	44.8	7	2.135	5	7 5	--
1848	27.83	51 5	—12. 0	63 5	7	2 245	8	7.1	5.82
1849	18.49	40.1	—15. 2	55 3	4	1.175	10	9.2	6.71
1850	29 11	46.3	10. 6	35 7	5	1.250	8	5.2	5.80
1851	25.62	43 2	—12. 8	56 0	4	1.275	10	7.8	7.69
1852	18.51	37.3	— 7. 0	44 3	0	0.000	19	30.9	7.67
1853	22 98	40 9	— 6. 6	47.5	1	0.290	6	7.5	6.34
M'n	23.99	43.87	— 5.08	48.95	4.4	1.825	10.1	13.0	6.67

Monthly Meteorological Register, at St. Martin, Isle Jesus, Canada East, January, 1853.

Six Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—Estimated Height about 30 ft.

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Mean Velocity in Miles per Hour.			Rain in Inch.	Snow in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.									
1	29.615	29.744	29.821	9	7	0	.071	.061	.048	1.00	.92	1.00	N E	N	W N W	21.30	7.12	Calm.		9.50	Str. 4.	Clear.	Clear.	
2	.940	.915	.918	1	21	12.5	.048	.086	.096	.95	.64	1.00	N N W	N N W	N E b E	Calm.	Calm.	Calm.			Clear.	Str. 4.	Str. 10.	
3	.915	.845	.922	14	19	15	.097	.103	.108	.93	.82	1.00	N E b E	N E b E	N E b E	0.87	14.27	13.15		2.50	Str. 10.	Snow.	Snow.	
4	.985	.968	.963	2	12	— 5	.053	.061	.060	1.00	.63	1.00	N E b E	N E b E	N b W	13.21	18.17	13.64			Clear.	Clear.	Clear.	
5	.975	.914	.803	—4	11	0	.058	.063	.048	1.00	.67	1.00	N W	W S W	S b E	2.32	0.38	1.22			Str. 10.	Clear.	Str. 10.	
6	.669	.603	.584	19	30	30	.125	.177	.186	1.00	.95	1.00	S S W	S S W	S S W	Calm.	5.48	4.28			do.	Cirr.St10	do.	
7	.496	.599	.709	26	38	35	.129	.207	.222	.80	.84	1.00	SW b W	SW b W	S W b W	5.62	3.76	9.00			do.	Str. 10.	Clear.	
8	.894	.909	.812	26	40	27	.161	.219	.167	1.00	.80	1.00	W	E N E	E N E	6.55	5.99	0.50			Cirr. 3.	Clear.	Clear.	
9	.642	.746	.800	21	38	37	.134	.230	.238	1.00	.94	1.00	N E	E N E	W b N	2.10	6.91	2.71			Str 10.	Str. 10.	Clear.	
10	.822	.801	.756	35	37	33	.222	.238	.187	1.00	1.00	.90	W b S	S	S W	2.69	5.84	5.72			Cirr.Str.8	Cirr. K. 4	Cirrstr10	
11	.925	.981	30.018	25	33	12	.148	.187	.090	.95	.90	.94	W b N	W N W	N E	6.43	5.41	5.82			Clear.	Cirr. 4.	Clear.	
12	30.216	0.226	.236	1	10	5	.048	.062	.049	.95	.80	.78	N E b E	N E b E	N E b E	4.25	3.24	4.82			Str. 10.	Clear.	Clear.	Faint Aurora Bor.
13	.194	.105	.056	2	18.5	14	.051	.094	.097	.95	.85	.93	N E b E	N E b E	N E b E	16.12	11.82	8.21			Cirr.St. 4.	Clear.	Clear.	Do. do.
14	.031	29.910	29.814	9	27	.19	.071	.129	.110	1.00	.80	.88	N E b E	N E b E	NW b W	11.33	4.77	0.10			li'gt cir. 4	Str. 9.	Str. 10.	
15	29.684	.652	.605	20	29	16	.129	.170	.098	1.00	.94	.88	N W	N W	N W	1.01	2.14	15.40		Inap.	sl'gt snw	sli'gtsnw	Str. 10.	
16	.680	.696	.641	—2	2	1	.037	.042	.050	.85	.76	1.00	W N W	W N W	W N W	17.61	14.62	13.63			Str. 10.	Str. 10.	Str. 10	
17	.787	.807	.828	0	13.5	2	.048	.065	.053	1.00	.70	1.00	W	W S W	W S W	17.28	9.43	4.49			Str. 10	Clear.	Clear.	
18	.827	.742	.820	4	24	12	.056	.101	.076	.95	.67	.93	N N E	N E b E	NW b W	0.97	Calm.	Calm.		0.86	Snow.	Snow.	Str. 10.	
19	.875	.840	.835	12	24	17	.090	.121	.116	1.00	.80	1.00	W N W	W b S	W b S	Calm	3.00	3.74		Inap.	Str. 10.	Cirr.Str.4	Str. 10.	
20	.701	.543	.617	16	34	18.5	.087	.162	.122	.78	.75	1.00	W N W	W S W	W S W	Calm.	7.50	0.90			Str. 10.	Clear.	Str. 10.	
21	.645	.618	.642	21	40	25	.134	.219	.155	1.00	.80	1.00	W N W	W S W	SW b W	2.70	6.88	6.07			Str. 10.	Cirr.Str.4	Clear.	
22	.537	.502	.472	25	42	33	.155	.240	.207	1.00	.82	1.00	S S W	SW b W	S W b W	8.58	8.37	4.36			Str. 8.	Str. 4.	Str. 10.	
23	.315	.167	28.898	25	34.5	31	.155	.203	.192	1.00	.91	1.00	N E b E	N E b E	N E b E	1.46	2.50	11.90		4.50	Cirr. 3.	Sleet.	Snow.	
24	28.635	28.720	.950	28	28	19	.175	.163	.125	1.00	.94	1.00	N N E	W N W	W N W	25.09	4.35	7.27		2.60	Str. 10.	Snow.	Cirr.Str.4	
25	29.194	29.184	29.250	— 5	—3.7	— 1	.027	.040	.043	.68	.96	.95	N N E	E N E	W	8.55	10.14	11.64		3.00	Clear.	Snow.	Cirr.Str.5	
26	.512	.636	.968	—13	— 3	—18	.027	.029	.020	1.00	.68	.98	W N W	W	W b N	7.73	5.25	14.56			Clear.	Clear.	Clear.	
27	30.140	30.213	30.336	—28	— 4	—19	.012	.029	.020	1.00	.68	1.00	N N E	E b N	N E b E	Calm.	0.88	0.12			Cirr. 3.	Cirr. 2.	Clear.	
28	.382	.210	.185	—12	18	6.5	.021	.101	.063	.75	.94	1.00	N N W	W S W	S W b W	1.79	0.42	Calm.			Str. 10.	Clear.	Clear.	
29	.090	29.978	29.521	— 3	33	21	.043	.187	.116	1.00	.90	1.00	SW b W	S S W	S S W	1.77	0.96	Calm.			Clear.	Clear.	Str. 10.	Zodiacal Li't bri't
30	29.376	.600	.715	27	20	14	.140	.114	.075	.88	.87	.72	W N W	W N W	W N W	3.33	16.66	18.08			Clear.	Str. 4.	Str. W.	& well defined f'm
31	.775	.760	.949	7	22.5	—4.5	.061	.092	.039	.92	.65	1.00	E N E	N W	N W	8.04	2.06	0.87		0.40	Str. 10.	Str. 4.	Clear.	sunset till 8 p. m.

Barometer. Highest the 28th day - - - - - - 30.382
Lowest the 24th day - - - - - - 28.635
Monthly Mean - - - - - - 29.757
" Range - - - - - - - 1.747

Thermometer Highest the 22nd day - - - - - 42.0
Lowest the 27th day - - - - —28.7
Monthly Mean - - - - - - 16.68
" Range - - - - - - 70.7

Most prevalent Wind—the N. E. by E.

Least do. do. —S.

Most Windy Day—the 16th day.

Mean miles per hour—15.28.

Least do. do. —the 2nd day.

Mean Miles per Hour—Inapp.

Snow fell on 9 days, amounting to 23.36 inches.

Rain fell on 0 days.

Greatest intensity of the Sun's Rays—64.0.

Mean of Humidity—.909.

Aurora Borealis visible at Observation: Horizon—2nd night.

The Electrical state of the Atmosphere has been marked during the month, *generally* by feeble *positive* intensity, except on the 16th and 25th days, when it indicated very high Intensity of *Positive* with "spirtings" of *Negative* Electricity.

On the Preparation of Liquid Glue.—All chemists are aware, that when a solution of glue (gelatine) is heated and cooled several times in contact with the air, it loses the property of forming a jelly. M. Gmelin observed that a solution of isinglass, enclosed in a sealed glass tube and kept in a state of ebullition on the water-bath for several days, presented the same phenomenon—that is to say, the glue remained fluid, and did not form a jelly. The change thus produced is one of the problems most difficult of solution in organic chemistry. It may be supposed, however, that, in the alteration which the glue undergoes, the oxygen of the air or of the water plays a principal part; what leads me to think this, is the effect produced upon glue by a small quantity of nitric acid. It is well known that by treating gelatine with an excess of this acid, it is converted by heat into malic and oxalic acids, fatty matter, tannin, &c. But it is not thus when the glue is treated with its weight of water and with a small quantity of nitric acid; by this means a glue is obtained which preserves nearly all its primitive qualities, but which has no longer the power of forming a jelly. Upon this process, which I communicated, is founded the Parisian manufacture of the glue which is sold in France under the title of "*colle liquide et inaltérable.*" This glue being very convenient to cabinet-makers, joiners, pasteboard-workers, toy-makers, and others, as it is applied cold, I think it my duty, in order to increase its manufacture, to publish the process:—It consists in taking 1 kilog. of glue, and dissolving it in 1 litre of water in a glazed pot over a gentle fire, or, what is better, in the water-bath, stirring it from time to time. When all the glue is melted, 200 grms. of nitric acid (spec. grav. 1·32) are to be poured in, in small quantities at a time. This addition produces an effervescence, owing to the disengagement of hyponitrous acid. When all the acid is added, the vessel is to be taken from the fire, and left to cool. I have kept the glue, thus prepared in an open vessel during more than two years, without its undergoing any change. It is very convenient in chemical operations; I use it with advantage in my laboratory for the preservation of various gases, by covering strips of linen with it.—M. S. Dumoulin: *Comptes Rendus*, Sept. 27.

On the composition and microscopic structure of certain Basaltic and Metamorphic Rocks, by Dr. Andrews.—By examining a thin splinter of basalt under the microscope, Dr. Andrews has succeeded in detecting the presence of the following minerals: 1st, a colourless glassy mineral, probably some variety of Zeolite; 2nd, Augite; 3rd, Magnetic oxide iron; 4th, Iron Pyrites. By examining the metamorphic rock of Poitrush, an indurated clay containing the characteristic fossils of the lias formation, an immense number of very minute crystals of iron pyrites were discovered, and on reducing it to powder and touching with a magnet, a quantity of magnetic oxide of iron was extracted. This mineral seems to be much more universally diffused than is generally supposed, it having been detected by Dr. Andrews, in various specimens of basalt, granite, primitive limestone, hardened chalk, magnesian limestone, and many metamorphic rocks. In roofing slate, serpentine and marble, only a doubtful trace could be detected.

Dr. Andrews has also succeeded in detecting the presence of metallic iron in various basalts. Pure or uncombined iron exists in meteoric stones, which are very similar in many respects to basalt, but the instances of its having been found as a mineral, are very few, and not in every case well authenticated. The grains of iron in the Uralian gold and platinum sands, have been proved by Rose, to arrive from the iron vessels employed in the washing, and Dr. Andrews expreses some doubt as to the iron of Canaan, in Connecticut. The method of detecting the metallic iron, is to reduce the mineral to powder, to extract the magnetic particles by means of a magnet, and having brought them into the field of the microscope, to moisten them with an acid solution of sulphate of copper; a deposit of red metallic copper then takes place. If dilute sulphuric acid be employed alone, an effervescence will be observed from various points, which ceases immediately on the addition of the copper solution, a red precipitation being produced. Dr. Andrews has selected the iron in several basalts, in the indurated lias slate of Portrush, and in the trachyte of Auvergne.

The effect might possibly be produced by nickel and cobalt, instead of iron, but the presence of either of these metals, is exceedingly improbable. Dr. Andrews seems inclined to ascribe the origin of the metallic iron, to the reducing agency of such gases as hydrogen or carbonic oxide, while the basaltic rock was still in a state of ignition.—*British Association, Belfast, Sept. 2nd,* 1852.

Mr. Lettsom has also discovered the presence of metallic iron in fossil wood.—*Philosophical Magazine, November,* 1852.

CANADIAN INSTITUTE.

ANNUAL CONVERSAZIONE.—NOTICE TO COUNTRY MEMBERS.

On Saturday, March 26th, the Annual Conversazione of the Canadian Institute will be held in the Hall of the Legislative Assembly, Toronto.

It is confidently anticipated, that before the close of the present Session, the number of Members of the Institute will exceed three hundred; and as there are many country members residing within a few miles of the city of Toronto who may wish to attend the Annual Conversazione, we take this early opportunity of announcing the day on which it will take place.

OBITUARY.

Death of Sears C. Walker.—The death of this eminent mathematician and astronomer took place on the 30th of January, at the residence of his brother, Judge Walker, at East Walnut Hills, near Cincinnati. Mr. Walker was born at Wilmington, Mass., in 1805; graduated at Cambridge in 1825. After his graduation at Cambridge, he constantly devoted, as an amateur, much of his time to his favourite science, but for some years past he was connected with the Coast Survey.

About eighteen months ago he was attacked, in this vicinity, by severe illness, from which, although induced by his zeal to attempt to resume his scientific labours, he never, but partially, recovered.

The researches of Mr. Walker, especially those respecting the motions and the elements of the planet Neptune, gained him a high reputation in Europe, and some years since the Royal Astronomical Society of London elected him a member.

Mr. Walker, as a theoretical and practical astronomer, was equalled by few, and probably not excelled by any one in the United States.

Death of Great Grand-Children of Burns.—We find the following melancholy announcement in the *Dumfries Courier* of Tuesday last:—"Died, at sea, on board the ship Chance, from Liverpool to Port Philip, on the 7th of September last, Arabella Ann; on the 8th September, Robert Burns; on the 18th September, Arthur Vincent, the only children of Mr. Berkeley W. Hutchinson, surgeon, government medical officer of the Chance, and great grand children of Robert Burns." Mrs. Hutchinson is the daughter of Major James Glencairn Burns, and was educated in Dumfries, under the care of her grandmother, "Bonnie Jean."

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription,) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute. First—Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. Second—Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal;* and an acquaintance with the improvement in Art and the rapid progress of Science in all countries,—a marked feature of the present generation. Third—Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable and, to say the least, a patriotic undertaking,—a wish to encourage a Society where men of all shades of religion or politics may meet on the same friendly grounds: nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, MARCH, 1853.

CONTENTS:

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All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

The Canadian Journal.

TORONTO, MARCH, 1853.

"On the Land-birds wintering in the neighbourhood of Toronto."

BY G. W. ALLAN, ESQ.

(*Read before the Canadian Institute, February 26th,* 1853.)

It is not, I believe, an uncommon idea, even among those who have in some degree interested themselves in observing the movements and habits of our different birds, that when once the frosts and snows of winter have fairly set in, our woods are almost completely deserted by their feathered denizens.

It would probably, therefore, be a matter of surprise to many to learn that there are at least twenty different species of land birds, which remain with us through the whole of our long winter, braving the severest cold, and apparently finding abundant provision for the supply of their various wants.

I shall endeavour in this paper to give a few brief, though I fear very imperfect, notices of some of these different species, as they have fallen under my own observation at various times during the course of my rambles about the woods and fields in the immediate neighbourhood of Toronto. Some of the birds I shall mention are winter visitors only; others again remain with us throughout the whole year.

To begin with the birds of prey; the first I shall notice: the Bald-headed Eagle, although very rare, *has been* seen in this neighbourhood. On the shores of the Lake, near the Scarborough Heights, and about the Humber Bay, a solitary bird may still occasionally be met with. I saw one about three weeks ago, for the first time for many years flying down the valley of the Don towards Ashbridge's Bay: its white head, and the broad white patch near the tail, as well as its great size, render it easily distinguishable; and even at some little distance it may readily be recognized by its peculiar flight, which, when making for a *particular point*, is remarkably direct; never circling or sailing, but supported by long continuous equal strokes of the wings, without intermission, as long as the bird is in sight.

Of the owls, the large white or snowy Owl, (Stryx Nyctea) is one of the most beautiful of our rapacious birds. Nothing can exceed the exquisite softness and beauty of its thick warm plumage, which enables it to bid defiance to the severest cold. Its colour varies slightly according to the age of the bird, but when full grown it is a rich creamy white, the edges of the feathers of the head and back tipped with crescent-shaped spots of brown, and the wings and tail barred with the same colour. This owl pursues its prey during the day as well as at dusk, and its flight is extremely rapid and noiseless. It is not over nice in its choice of food; squirrels, rats, mice, small birds, and fish, all seem equally welcome.

The great horned Owl (Stryx Virginiana,) is now, I believe, rarely found here. I once shot a very fine specimen in the shrubbery close to my own house—an unusual place to meet with one, as it is in general a solitary bird, preferring some thick wood on the edge of a clearing, from which it sallies forth in the fine moonlight nights in search of its prey. Their plumage is very handsome, the prevailing colour being a rich reddish brown, barred and mottled with brownish black and reddish yellow. The horns are broad, and three inches in length, formed of twelve or fourteen small feathers, with black webs and edged with brownish yellow.

The barred or grey Owl, (Stryx Nebulosa) is a very common visitor to our woods during the winter. It is generally found in pairs; it is a smaller bird than the horned owl, and its plumage, though very soft and warm, is much inferior in richness and beauty. Small birds and mice are its favourite food, but a stray chicken or young pigeon does not come amiss to him. It is the funniest possible thing, to watch the gesticulations of one of these birds, when approaching them in daylight. It bends its whole body forward, puffing up the lateral feathers of the head so as to form a sort of ruff; moving its head at the same time rapidly to and fro, and eyeing the intruder in the most grotesque manner.

The little horned owl is still found in this neighbourhood. It is an inoffensive little creature, generally keeping itself very quiet till towards evening, for should it be caught abroad during the day by other birds, they never fail to express their dislike and antipathy in a very decided manner. A few weeks ago, while giving directions to some work people at my own place, my attention was attracted by the loud screaming and chattering of a party of blue-jays, collected in some low pine bushes a few yards from where I was standing. On going up to the spot to ascertain the cause of the uproar, the jays flew off, and seeing neither hawk or cat, I returned again to my men. I had hardly done so before the jays were all back, and the screaming was renewed with ten-fold vigour. Determined to see what the matter was this time, I pushed my way through the bushes, and after looking carefully, but without success, in every direction for the cause of the disturbance, was on the point of giving it up in despair, when turning round suddenly, I almost brushed up against a beautiful little-horned owl, sitting bolt upright on a small branch close to the stem of a pine bush, and eying me with the most imperturbable gravity. This little fellow hardly measured ten inches; his plumage was exceedingly soft and beautiful, barred alternately with wavy lines of a rich brown, grey and black.

Of the hawk tribe, the most common is the Pigeon Hawk; (Falco Columbarius) one or more solitary individuals hang about our woods and fields in the neighbourhood of the town all winter; and very fat and plump they become, making sad havoc amongst the flocks of red-polls and siskins, and every now and then paying an unwelcome visit to the nearest dove-cot. The colour of the adult male is generally a light blueish grey, each feather marked with a black central line, the lower parts reddish white, the breast and belly yellowish white marked with large oblong brown spots.

Among the birds of prey may properly be classed the great American Shrike, (Lanius Borealis,) for a bolder or more rapacious bird for its size does not exist. Many years ago I was fortunate enough to procure a very fine specimen; I then lost sight of the bird for several years, and almost despaired of meeting with it again, when, one fine winter's morning, a very large one dashed through a pane of glass at a pet goldfinch, whose cage happened to stand close to the window, in one of the rooms at my own house. Being a little stunned with the shock, and his wings slightly injured by the broken glass, I secured him without much difficulty. He was a remarkably fine bird, measuring rather more than ten inches, and nearly fifteen inches across the wings. The upper part of the head and body was a clear blueish grey, the sides of the head nearly white, crossed with a bar of black, passing from the nostril through the eye to the middle of the neck; the belly nearly white, marked with narrow wavy dark lines; wings black, with a white bar; the two centre feathers of the tail all black; the rest black edged withwhite.

The next birds I shall notice are the Jays: of these we have two kinds; one remaining with us all the year round, the other only a winter bird. The Canada Jay, (Garrulus Canadensis) or Whiskey-Jack, as he is called in the north-west, is never met with here except in the depth of winter; and, even then, it must be very severe weather that drives these birds as far south as this.

They appeared in great numbers in the winters of 1839 and '40, flying about the woods and fields in flocks of fifteen or

twenty, feeding upon seeds, berries and the larvae of insects. At other times frequenting the country roads, picking up the scattered grains from among the droppings of the horses, and often coming boldly to the very doors of the farm houses, in search of crumbs or scraps of meat. Its plumage is well calculated to resist the severest cold, the bird being a perfect bag of feathers, which, about the head particularly, are so loose and uneven, as to give it a peculiarly inelegant ragged look. Its colour is a dirty ash inclining to drab, the breast and belly dirty white.

The blue jay, (Garrulus Cristatus) is too well known to require description.

He is one of the noisiest tenants of our woods; and his screaming notes may be heard just as frequently in the depth of winter as in the middle of summer. He has fortunately a most accommodating appetite; so that when his summer fare of cherries, strawberries, caterpillars and grubs, and still worse, the eggs of small birds, for which he has a decided relish, are not to be had, he takes quite as readily to beech nuts, acorns, the seeds of the pine, or the berries of the mountain ash.

I come now to a bird which may be classed as among the handsomest, and at the same time the rarest of our winter visitors, the Pine Grosbeak, (Pyrrhula Enucleator.) This hardy species is found throughout Labrador, and the Hudson's Bay Territory; and it is only in very severe seasons that it visits us. It was very abundant in this neighbourhood in the winter of 1839, visiting our gardens and orchards in large flocks, feeding upon the tender buds of the cherry, the apple, and other fruit trees. To the seeds of the apple they appeared particularly partial, any withered fruit that might have been left upon the trees being stripped off directly, and cut in pieces in search of their favourite food. Having observed that a party of them paid frequent visits to some lilac trees growing against the verandah of my father's house, for the sake of the seeds that were still hanging upon the trees, I had a quantity of broken pieces of apple scattered about the verandah. The next visit the birds paid, the lilacs were speedily deserted, and the pieces of apple disappeared in a wonderfully short space of time. I continued to have fresh supplies provided for them, and by degrees the number of my pensioners increased, until there were sometimes as many as twelve or fourteen feeding at the same time, and they ultimately became so tame, as to allow any of the family to watch them while feeding from the windows, although they were hardly two feet from them. I may mention, however, that notwithstanding their daily feed of apples the lilacs did not escape, for not content with the seeds, they stripped the trees so effectually of their flower buds that the following summer there was hardly a blossom to be seen.

The general colour of the plumage of this bird is a blueish slate colour on the back and sides, deepening into black on the wings and tail. The head, neck, shoulders, and top of the rump in the male bird are of a reddish orange, varied in some specimens with very beautiful delicate tints of carmine. In the female these markings, are much less vivid, generally yellowish orange with lighter tints of dirty yellow.

Their note is peculiarly soft and full, and the call note which they utter when flying resembles slightly that of the blue bird.

In former days, when thick pine woods occupied the greater part of the space half-a-mile to the north of Queen Street, lying between Yonge Street and the Don, the Crossbill (Loxia Curvirostra,) was a constant and well known visitor. Even then it was a difficult bird to obtain a specimen of, as it generally frequented the tops of the loftiest pines, feeding upon the seeds contained in the pine cones, their strong crooked bills enabling them to force open the scales with ease.

The plumage of the male bird is exceedingly handsome, particularly towards the approach of spring, when the colouring becomes much moie vivid.

The general colour of the body is olive, inclining to greenish grey, the head, throat, upper part of the back, and top of the rump a reddish orange, deepening into scarlet. The female is much plainer, the body being greenish grey, and the markings on the head and back pale yellow.

A frequent companion of the Crossbill is the Pine Linnet, (Linara Pinus); it also feeds upon the seeds of the pine, as well as the buds of the alder, larch and poplar. It is a pretty, graceful little bird, the plumage greenish yellow, marked with dark olive brown, the breast and belly white with brown spots, the wings and tail brown, edged with yellow. In its flight it resembles the Goldfinch, rising and falling in deep curves like that bird, and emitting its call note at each fresh effort it makes to propel itself.

The lesser Red Poll, (Fringilla linaria) is not unlike the Siskin in some of its habits; and in the spring of the year the latter, deserting its friends the Crossbills, is often seen feeding very lovingly in company with the Red Poll and the Gold Finch. The Red Poll always flies in flocks, and is a hardy merry little creature, feeding upon the seeds of various grasses, berries, and the buds of different trees. In very stormy weather, when the snow is deep in the woods and fields, they may be seen about the streets of the town, often venturing into the outhouses in search of crumbs, or about our poultry yards, picking up any stray grains that the fowls may have left.

Their call note is almost precisely the same as that of the Goldfinch, which they also resemble in their flight. The rose colour on the head and breast deepens into crimson at the approach of spring. The bird, I believe, breeds here, although I have never been fortunate enough to find a nest.

The Goldfinch (Fringilla Tristis) remains with us all the year round, but in winter the Cockbird doffs his gay summer plumage, and puts on the sober brown suit of the female. It feeds at this season of the year, like the Red Poll and Siskin, upon seeds of different kinds, as well as the buds of the Alder birch, and poplar. In flight and song it closely resembles its European namesake, rising and falling in long graceful curves, uttering at the same time its call note, and often singing sweetly while on the wing. Like its European relative, it is extravagantly fond of the seed of the thistle. It tears up withered petals of the ripened flowers with great dexterity, and leaning downwards upon them eats off the seeds, allowing the down to float away.

We come now to a merry little fellow, familiar to most of us, the black capped Titmouse, (Parus atracapillus,) or Chickadee, as the country people call him. The colder and more stormy the weather, the merrier does this hardy restless little bird appear. They keep together generally in little flocks of five or six, flying from tree to tree, and branch to branch, repeating their quick lively note, peeping into every little chink and crevice in the bark, frequently hanging head downwards at the extremity of a twig, with their feet almost up to their bills, pecking at a berry or a seed. They have a most accommodating appetite, feeding upon insects, their larvæ and eggs, berries and seeds, and even upon scraps thrown out from the kitchen; indeed I have often seen a Titmouse pecking away at a dish of bones that had been placed in the yard for the dog. Although shy enough at other times, the Titmouse become quites familiar in winter, alighting close to you without hesitation, and if you remain perfectly motionless, will pick up a seed or a berry almost from between your feet. It is Audubon, I think, who mentions an anecdote related to him by a friend of his, who while out shooting, and passing through a newly felled wood

over which a fire had recently passed, and left everything black, in its course,—saw a small flock of Titmice coming from the opposite side of the clearing. Being dressed in dark clothes and aware of their familiarity, he stood perfectly motionless, for the purpose of ascertaining how near they would approach. Stealing from branch to branch, and pecking for food among the crevices of the prostrate trunks as they passed along, onward they came, until the foremost settled upon a small twig, a few feet from the spot upon which he stood. After looking about for a short time, it flew and alighted just below the lock of a double-barrelled gun, which he held in a slanting direction below his arm, being unable, however, to obtain a hold, it slid down to the middle of the piece, and then flew away, jerking its tail and apparently quite unconscious of having been so near the deadly weapon.

The next I shall notice, are the Sparrows and Buntings.

Of the Sparrows, the Tree Sparrow, (Fringilla Canadensis,) is the only one that braves our winters. Large numbers of them *do* migrate to the middle and southern States, but small parties of ten or twelve, may often be seen among our shrubberies and gardens. It is such a well known bird that I need not stop to describe it.

As soon as the first hard frosts have stiffened the ground, that harbinger of winter, the Snow Bunting, (Eruberiza Nivalis,) makes its appearance, flying high in large flocks, their white bodies shewing against the clear blue sky, they look almost like large feathery flakes of the substance from which they derive their name. They seldom or never enter the woods, preferring wide open clearings, or the shores of the lake. The peninsula on the opposite side of our harbour, is a very favorite resort of this bird. They feed on grains, grass seeds, and the larvæ of insects.

Early in March, or even in February, if the season be a mild one, the Snow Bunting begins towing its way towards the desolate regions of the far north; as early as the middle of February, some straggling flocks have been seen in the neighbourhood of the Saskatchewan, on their way to the northward, and by the beginning of May, they have perhaps penetrated to the very shores of the Polar Sea. Only one nest of this bird, according to Audubon, has ever been found in the United States, that was seen by a gentleman of Boston, on the summit of one of the White Mountains, in New Hampshire. Richardson, gives Southampton Island, in the 62nd parallel of latitude, as the most southerly of their breeding stations. Captain Lyons found a nest there, strangely enough, placed in the bosom of an exposed corpse of an Esquimaux child.

Of the Wood-Pecker tribe, there is one industrious little hunter, the Hairy Wood Pecker, (Picus Villosus,) who may be seen hard at work in the very coldest weather, tapping and chiselling away, flying from tree to tree, and dodging from one branch to another, uttering its peculiar sharp shrill cry, and seeming possessed with the very spirit of restlessness, the colour of the plumage is varied black and white, with a small red band at the back of the head.

There is a still smaller species, the downy Wood-pecker, (Picus pubescens) which resembles the Hairy Wood-pecker so closely in plumage, that it can only be distinguished by the difference in size, this species not measuring more than six inches.

Nearly allied to the Wood-peckers are the Nuthatches. Of these the red-bellied Nuthatch (Sitta Canadensis) seldom deserts us. A few migrate to the middle American States, but through the greater part of the winter, their curious nasal "kauk" may be heard in our woods. If you follow up the sound you will be sure to find the little fellow creeping round the trunk of some old tree searching for spiders, or the eggs or larvæ of insects, concealed in the crevices of the bark.

I was not aware, until this winter, that that pretty elegant bird, the Cedar or Cherry Bird, (Bombycilla Carolinensis) ever ventured to remain so far north beyond the autumn months. This winter, however, I have noticed a small flock feeding upon the berries of some mountain ash trees, close to my own house. Their congeners, the large European Wax-wing, (Bombycilla garrula) have been seen here occasionally. They are a larger bird than the common Chatterer, but the plumage is almost precisely the same, and they both have the curious vermillion appendages, resembling sealing wax, on the secondaries of the wings.

Of the game birds the Ruffled Grouse, (Tetrao Umbellus) the Spruce Grouse, (Tetrao Canadensis) and the Quail, (Ortyx Virginiana) are all constant sojourners with us, being generally seen in greater numbers in winter, as they then come nearer the haunts of man than at any other season of the year.

I am afraid, however, they will soon cease to be among the number of our feathered visitors, either in winter or summer.

The Ruffed Grouse used to be found among the pine and hemlock woods, lying between the cemetery and Castle Frank, and in many places along the banks both of the Don and Humber. But increasing population and extended cultivation, have driven them from all their old haunts, and the sportsman or the naturalist, must now seek in more remote and less settled districts, for this noble game bird.

I hardly know whether I am correct in enumerating the spotted grouse, or spruce partridge, as it is commonly called, as among the number of the birds found in the immediate neighbourhood of Toronto. I have never shot one myself, but I have had specimens brought to me, which were said to have been procured not very many miles from here.

Their favourite resorts, are the deepest pine and spruce woods and cedar swamps, where they feed upon the buds and seeds of the different evergreens, a diet which renders them at certain seasons of the year not very palatable eating.

They are very handsome birds. Their general colour is a black brown and grey mingled in transverse wavy bands and spots. The cock bird has a small red bare space over each eye like the European moor fowl.

The Quail is still occasionally heard uttering its plaintive cry in autumn and winter about our woods and fields. In former days large coveys used to remain in the stubble fields and about our barn yards, from October until March, but like other game birds, they have experienced no mercy at the hands of those gentry who shoot for the market, and I fear that in the course of a few years, they will have disappeared altogether from this neighbourhood.

I made great efforts about three or four years ago, to keep them about the woods at my own place, and so far succeeded that they bred there for one spring, and I had the pleasure of seeing a number of young birds flying about the following summer, apparently quite contented with their quarters, and but little inclined to stray beyond them.

During my subsequent absence from home, however, some of the before-mentioned gentry got into the wood, and shot half the birds, and the rest of the scattered and frightened covey betook themselves to a safer and more distant cover, and have never since returned to their old haunts.

I have now briefly adverted to most of the different species of land-birds to be met with in this neighbourhood, from November to March. Many of them, like the game-birds, are becoming more rare every year, seeking in less populous districts for the

shelter and food which their former haunts no longer afford them.

I trust that the attempt made in the present communication to contribute in some slight degree to our acquaintance with this interesting department of Natural History, may have the effect of inducing other members of the Institute, better qualified for the task, to exert themselves in adding, by their personal observation, to our knowledge of Canadian Ornithology, while the facilities for doing so are still, comparatively, so many and so great.

Directions for collecting, preserving and transporting Specimens of Natural History.*

§ I. INSTRUMENTS, PRESERVATIVE MATERIALS, &c.

1. Implements for Skinning.—The implements necessary in skinning vertebrated animals are: 1. A knife, such as is used for ordinary dissection, and which may be replaced, in extreme cases, by a penknife. 2. A pair of sharp-pointed scissors, and one with strong short blades. 3. Needles and thread for sewing up the incisions in the skin. 4. A hook by which to suspend the carcase of the animal while the operation of skinning is going on. To prepare the hook, take a string, of from one to three feet in length, and fasten one end of it to a stout fish-hook which has had the barb broken off. By means of a loop at the other end, the string may be suspended to a nail or awl, which, when the hook is inserted into the body of an animal, will give free use of both hands in the operation of skinning.

2. Preservatives.—The best material for the preservation of skins of animals consists of powdered arsenious acid, or the common arsenic of the shops. This may be used in two ways, either applied in dry powder to the moist skin, or else mixed with alcohol or water to the consistency of molasses, and put on with a brush. To the alcoholic solution should be added a little camphor. There are no satisfactory substitutes for arsenic; but, in its entire absence, corrosive sublimate, arsenical soap, camphor, alum, &c., may be employed.

The proper materials for stuffing out skins will depend much upon the size of the animal. For small birds and mammalia, cotton will be found most convenient; for the larger, tow. For those still larger, dry grass, straw, sawdust, bran, or other vegetable substances, may be used. Whatever substance is used, care must be taken that it be perfectly dry. In no event should animal matter, as hair, wool, or feathers, be employed.

§ II. SKINNING AND STUFFING.

1. Birds.—Whenever convenient, the following notes should be made previous to commencing the operation of skinning, as they will add much to the value of the specimens:—

1. The length, in inches, from tip of bill to the end of the tail; the distance between the two extremities of the outstretched wings; and the length of the wing from the carpal-joint. The numbers may be recorded as follows: 44, 66, 12 (as for a swan), without any explanation; it being well understood that the above measurements follow each other in a fixed succession. These numbers may be written on the back of the label appended to each specimen.

2. The color of the eyes, that of the feet, bill, gums, membranes, caruncles, &c.

3. Are the heels covered or uncovered by the feathers of the belly?

4. Attitude of the body when at rest, whether vertical, oblique, or horizontal. Does the bird perch or not?

5. Position of the wings, whether supported or hanging, crossing on the tail or not. Are they continuous, and covered by the feathers of the mantle (back) and breast for the upper third, the half, or the two-thirds of their length? Their extremity; does it reach the end of the tail, the half, or the fourth of its length? The three last points will be of great use in mounting the specimens.

Immediately after a bird is shot, the holes made by the shot should be plugged up, and the mouth and posterior nostrils plugged with cotton, to prevent the escape of blood and the juices of the stomach. A long narrow paper cone should be made; the bird, if small enough, thrust in, head foremost, and the open end folded shut, taking care not to break or bend the tail feathers in the operation.*

When ready to proceed to skinning, remove the old cotton from the throat, mouth, and nostrils, and replace it by fresh. Then take the dimensions from the point of the bill to the end of the tail, from the tip of one wing to that of the other, when both are extended, and from the tip of the wing to the first or carpal-joint, as already indicated.

This being done, make an incision through the skin only, from the lower end of the breast bone to the anus. Should the intestines protrude in small specimens, they had better be extracted, great care being taken not to soil the feathers. Now proceed carefully to separate the skin on each side from the subjacent parts, until you reach the knee, and expose the thigh; when, taking the leg in one hand, push or thrust the knee up on the abdomen, and loosen the skin around it until you can place the scissors or knife underneath, and separate the joint with the accompanying muscles. Place a little cotton between the skin and body to prevent adhesion. Loosen the skin about the base of the tail, and cut through the vertebræ at the last joint, taking care not to sever the bases of the quills. Suspend the body by inserting the hook into the lower part of the back or rump, and invert the skin, loosening it carefully from the body. On reaching the wings, which had better be relaxed previously by stretching and pulling, loosen the skin from around the first bone, and cut through the middle of it, or, if the bird be small enough, separate it from the next at the elbow. Continue the inversion of the skin by drawing it over the neck, until the skull is exposed. Arrived at this point, detach the delicate membrane of the ear from its cavity in the skull, if possible, without cutting or tearing it; then, by means of the thumb-nails, loosen the adhesion of the skin to the other parts of the head, until you come to the very base of the mandibles, taking care to cut through the white nictitating membrane of the eye when exposed, without lacerating the ball. Scoop out the eyes, and by making one cut on each side of the head, through the small bone connecting the base of the lower jaw with the skull, another through the roof of the mouth at the base of the upper mandible, and between the jaws of the lower, and a fourth through the skull behind the orbits, and parallel to the roof of the mouth, you will have freed the skull from all the accompanying brain and muscle. Should anything still adhere, it may be removed separately. In making the two first cuts, care must be taken not to injure or sever the zygoma, a small bone extending from the base of the upper mandible to the base of the lower jaw-bone. Clean off every particle of muscle and fat from the head and neck, and, applying the preservative abundantly to the skull, inside and out, as well as to the skin, restore these parts to their natural position. In all the preceding operations, the skin should be handled as near the point of adhesion as possible, especial care being taken not to stretch it.

The next operation is to connect the two wings inside of the

* Prepared for the use of the Smithsonian Institution.

* Crumpled or bent feathers may have much of their elasticity and original shape restored by dipping in hot water.

skin by means of a string, which should be passed between the lower ends of the two bones joining the forearm, previously, however, cutting off the stump of the arm, if still adhering at the elbow. Tie the two ends of the string so that the wings shall be kept at the same distance apart, as when attached to the body. Skin the leg down to the scaly part, or tarsus, and remove all the muscle. Apply the arsenic to the bone and skin, and, wrapping cotton round the bone, pull it back to its place. Remove all the muscle and fat which may adhere to the base of the tail or the skin, and put on plenty of the preservative wherever this can be done. Lift up the wing, and remove the muscle from the forearm by making an incision along it, or, in many cases, the two joints may be exposed by carefully slipping down the skin towards the wrist-joint, the adhesion of the quills to the bone being loosened.

The bird is now to be restored to something like its natural shape by means of a filling of cotton or tow. Begin by opening the mouth and putting cotton into the orbits and upper part of the throat, until these parts have their natural shape. Next take tow or cotton, and, after making a roll rather less in thickness than the original neck, put it into the skin, and push firmly into the base of the skull. By means of this you can reduce or contract the neck if too much stretched. Fill the body with cotton, not quite to its original dimensions, and sew up the incision in the skin, commencing at the upper end, and passing the needle from the inside outwards; tie the legs and mandibles together, adjust the feathers, and, after preparing a cylinder of paper the size of the bird, push the skin into it so as to bind the wings closely to the sides. The cotton may be put in loosely, or a body the size of the original made by wrapping with threads. If the bird have long legs and neck, they had better be folded down over the body, and allowed to dry in that position. Economy of space is a great object in keeping skins, and such birds as herons, geese, swans, &c., occupy too much room when all their parts are in a natural position.

In some instances, as among the ducks, woodpeckers, &c., the head is so large that the skin of the neck cannot be drawn over it. In such cases, skin the neck down to the base of the skull, and cut it off there. Then draw the head out again, and making an incision on the outside, down the back of the skull, skin the head. Be careful not to make too long a cut, and to sew up the incision again.

2. Mammals.—The mode of preparing mammals is precisely the same as the preceding, in all its general features. Care should be taken not to make too large an incision along the abdomen. The principal difficulty will be experienced in skinning the tail. To effect this, pass the slip-knot of a piece of strong twine over the severed end of the tail, and, fastening the vertebræ firmly to some support, pull the twine towards the tip until the skin is forced off. Should the animal be large, and an abundance of preservative not at hand, the skin had better remain inverted. In all cases, it should be thoroughly and rapidly dried.

Skins may also be preserved, for a time, in spirits, in the absence of other preservative. This would, at all events, be better than their drying, especially in localities abounding in noxious insects.

For the continued preservation of hair or fur of animals against the attacks of moths and other destructive insects, it will be necessary to soak the skins in a solution of corrosive sublimate, in alcohol or whisky, allowing them to remain from one day to several weeks, according to the size. After removal, the hair must be thoroughly washed or rinsed in clean water, to remove as much as possible of the sublimate; otherwise, exposure to light will bleach all the colors.

In some instances, large skins may be preserved by being salted down in casks.

With regard to the tails of mammalia, it may be well to remark that in some it can never be forced off in the common way of doing this operation. This is particularly the case with *beavers*, *opossums*, and those species which use their tail for prehension or locomotion. Here the tail is usually supplied with numerous tendinous muscles, which require it to be skinned by making a cut along the lower surface or right side of that organ, nearly from one end to the other, and removing the bone and flesh. It should then be sewed up again, after a previous stuffing.

3. Reptiles.—The larger *lizards*, as those exceeding twelve or eighteen inches in length, may be skinned according to the principles above presented, although preservation in spirits, when possible, is preferable for all reptiles.

Large *frogs* and *salamanders* may likewise be skinned, altho' cases where this will be advisable are very rare.

Turtles and *large snakes* will require this operation.

To one accustomed to the skinning of birds, the skinning of frogs or other reptiles will present no difficulties.

The skinning of a snake is still easier. Open the mouth and separate the skull from the vertebral column, detaching all surrounding muscles adherent to the skin. Next, tie a string around the stump of the neck, and, holding on by this, strip the skin down to the extremity of the tail. The skin thus inverted should be restored to its proper state, and then put in spirit or stuffed, as convenient. Skins of reptiles may be stuffed with either sand or sawdust, by the use of which their shape is more easily restored.

Turtles and tortoises are more difficult to prepare in this way, although their skinning can be done quite rapidly. "The breastplate must be separated by a knife or saw from the back, and, when the viscera and fleshy parts have been removed, restored to its position. The skin of the head and neck must be turned inside out, as far as the head, and the vertebræ and flesh of the neck should be detached from the head, which after being freed from the flesh, the brain, and the tongue, may be preserved with the skin of the neck. In skinning the legs and the tail, the skin must be turned inside out, and, the flesh having been removed from the bones, they are to be returned to their places by redrawing the skin over them, first winding a little cotton or tow around the bones to prevent the skin adhering to them when it dries."—Richard Owen.

Another way of preparing these reptiles is as follows: Make two incisions, one from the anterior end of the breastplate to the symphysis of the lower jaw, and another from the posterior end of the breastplate to the vent or tip of the tail; skin off these regions and remove all fleshy parts and viscera without touching the breastplate itself. Apply preservative, stuff, and sew up again both incisions.

"When turtles, tortoises, crocodiles, or alligators, are too large to be preserved whole in liquor, some parts, as the head, the whole viscera stripped down from the neck to the vent, and the cloaca, should be put into spirit or solution."—R. Owen.

4. Fishes.—As a general rule fishes, when not too large, are best preserved entire in spirits.

Nevertheless they may be usefully skinned and form collections, the value of which is not generally appreciated. In many cases, too, when spirit or solutions cannot be procured, a fish may be preserved which would otherwise be lost.

There are two modes of taking the skin off a fish: 1st. The whole animal can be skinned and stuffed like a bird, mammal, or reptile. 2d. One half of the fish can be skinned, and nevertheless its natural form preserved.

Sharks, *skates*, *sturgeons*, *garpikes* or *garfishes*, *mudfishes*,

and all those belonging to the natural orders of *Placiods* and *Ganoids* should undergo the same process as given above for birds, mammals, and reptiles. An incision should be made along the right side, the left always remaining intact, or along the belly. The skin is next removed from the flesh, the fins cut at their bases under the skin, and the latter inverted until the base of the skull is exposed. The inner cavity of the head should be cleaned, an application of preservative be made, and the whole, after being stuffed in the ordinary way, sewed up again. Fins may be expanded when wet on a piece of stiff paper, which will keep them sufficiently stretched for the purpose. A varnish may be passed over the whole body and fins, to preserve somewhat the color.

In the case of *Ctenoids*, perches and allied genera; and *Cycloids*, trouts, suckers, and allied genera; one-half of the fish may be skinned and preserved. To effect this, lay the fish on a table with the left side up; the one it is intended to preserve. Spread out the fins by putting underneath each a piece of paper, to which it will adhere on drying. When the fins are dried, turn the fish over, cut with scissors or a knife all around the body, a little within the dorsal and ventral lines, from the upper and posterior part of the head, along the back to the tail, across the base of the caudal fin down, and thence along the belly to the lower part of the head again. The dorsal, caudal, and anal fins, cut below their articulations. This done, separate the whole of the body from the left side of the skin, commencing at the tail. When near the head, cut off the body with the right ventral and pectoral fins, and proceed by making a section of the head and removing nearly the half of it. Clean the inside, and pull out the left eye, leaving only the *cornea* and pupil. Cut a circular piece of black paper of the size of the orbit, and place it close to the pupil. Apply the preservative, fill the head with cotton as well as the body. Turn over the skin and fix it on a board prepared for that purpose. Pin or tack it down at the base of the fins. Have several narrow bands of paper to place across the body in order to give it a natural form, and let it dry. The skins may be taken off the board or remain fixed to it, when sent to their destination, where they should be placed on suitable boards of proper size, for permanent preservation.

Such a collection of well-prepared fish will be useful to the practical naturalist, and illustrate, in a more complete manner to the public, the diversified forms and characters of the class of Fishes, which specimens preserved in alcohol do not so readily show.

§ III. PRESERVING IN LIQUIDS, AND BY OTHER MODES BESIDES SKINNING.

1. General Remarks.—The best material for preserving animals of moderate size is alcohol. Next to this, rum or whisky (the stronger the better) may be employed. When spirits cannot be obtained, the following substitutes may be used:—

I. Goadby's Solution.—A. *The aluminous fluid*, composed of rock salt 4 oz.; alum 2 oz.; corrosive sublimate 4 grains; boiling water 2 quarts. B. *The saline solution*, composed of rock salt 8 oz.; corrosive sublimate 2 grains; boiling water 1 quart. To be well stirred, strained, and cooled.

II. A strong brine, to be used as hereafter indicated for Goadby's Solution.

III. In extreme cases, dry salt may be used, as in salting herring, &c.

To use Goadby's Solution, the animal should first be macerated for a few hours in fresh water, to which about half its volume of the concentrated solution may then be added. After soaking thus for some days, the specimens may be transferred to fresh concentrated solution. When the aluminous fluid is used to preserve vertebrate animals, these should not remain in it for more than a few days; after this, they are to be soaked in fresh water, and transferred to the saline solution. An immersion of some weeks in the aluminous fluid will cause a destruction of the bones. Specimens must be kept submerged in these fluids. The success of the operation will depend very much upon the use of a weak solution in the first instance, and a change to the saturated fluid by one or two intermediate steps.

The collector should have a small keg, jar, tin box, or other suitable vessel, partially filled with liquor, into which specimens may be thrown as collected. They should be alive, or as near it as possible when this is done, as besides the speedy and little painful death, the animal will be more apt to keep sound. The entrance of the spirit into the cavities of the body should be facilitated by opening the mouth, making a small incision in the abdomen a half or one inch long, and especially by injecting the liquor into the intestines through the anus, by means of a small syringe. After the animal has soaked for some weeks in this liquor, it should be transferred to fresh. Care should be taken not to crowd the specimens too much, and the slightest taint of putridity should be the signal for the employment of fresh spirits. When it is impossible to transfer specimens to fresh spirits from time to time, the strongest alcohol should be originally used.

To pack the specimens for transportation, procure a small keg, which has been properly swelled by allowing water to stand in it for a day or two, and from this extract the head by knocking off the upper hoops. Great care must be taken to make such marks on the hoops and head, as will assist in their being replaced in precisely the same relative position to each other and the keg, that they originally held. At the bottom of the keg place a layer of tow moistened in liquor, then one of specimens, then another of tow and another of specimens, and so on alternately until the keg is filled. Replace the head, drive down the hoops, and fill completely with spirits, by pouring through the bunghole. Allow it to stand at least half an hour, and then, supplying the deficiency of the liquor, insert the bung, and fasten it securely. An oyster-can or other tin vessel may be used to great advantage, in which case the aperture should be soldered up and the vessel inclosed in a box. A glass jar or bottle may also be employed, but there is always a risk of breaking and leaking. In the absence of tow, chopped straw, fine shavings, or dry grass may be substituted.

It is sometimes necessary to guard against the theft of spirits employed, by individuals to whom the presence of reptiles and fishes in the liquor is no objection. This may be done by adding a small quantity of tartar emetic, ipecacuanha, quassia, or some other disagreeable substance. The addition of corrosive sublimate will add to the preservative power of the spirit.

Should the specimens to be packed vary in size, the largest should be placed at the bottom. If the disproportion be very great, the delicate objects at the top must be separated from those below, by means of some immovable partition, which in the event of the vessel being inverted will prevent crushing. The most imperative rule, however, in packing, is to have the vessel perfectly full of something, any vacancy occupied only by air exposing the whole to the risk of loss. In carrying specimens in liquor when travelling, an almost insuperable difficulty is found in preventing rubbing, owing to the necessity of leaving enough space for the addition of specimens. This danger may be obviated by introducing an India-rubber, or oiled silk bag or bladder, provided with a valve, and blowing it up enough to fill the unoccupied space.

It often becomes a matter of great importance to separate the specimens of one locality from those of another, in the same vessel. This may be readily done by having a number of small bags made of mosquito net stuff, lino, or other porous material,

and from six to twenty inches long, by two to six wide. They are made like pillow-cases, open at one end, and sewed around the other three edges with coarse stitches. The specimens, on being gathered, may be put into a bag of proper size, and the mouth closed by tying a piece of thread. A number may be marked on the bag with a pencil, or with ink on a parchment label, placed inside or tied to one corner. These bags are of incalculable service on a march, or in transporting collections, the individuals of which are to be kept separate for any purpose whatever.

2. Vertebrata.—Fishes under six inches in length need not have the abdominal incision. Specimens with the scales and fins perfect should be selected, and, if convenient, stitched or pinned in bits of muslin, &c., to preserve the scales. In general, fishes under twelve or fifteen inches in length should be chosen. The skins of larger ones may be put in liquor. It is important to collect even the smallest.

With regard to the *sharks* and *skates*, it will be best to take the jaws and vertebral column as well as their skins. But, as it very often happens that bodies in a state of decomposition are met with upon the beaches or shores, it should then never be neglected to take these hard parts. The tail of skates is also desirable. If convenient, some vertebræ and teeth may be preserved in spirits for microscopic examination.

Reptiles, as already observed, should be preserved in liquids when their size does not forbid this mode of preservation. Persons at leisure may find pleasure in preparing the skins of many small kinds as a double series.

A collection of birds in alcohol or spirit would be a valuable acquisition to a public collection, as much is still to be learned with regard to their anatomical structure. There are no birds, with the exception of the large ostriches, which could not be collected for that purpose. This is a matter to which the collector should be especially attentive. Skins, however, of the first few individuals of rare species should be secured. And on a march it will not often be convenient to preserve specimens in spirit, as the space allotted for collections in alcohol is generally required for reptiles, fishes, small mammalia, and invertebrata.

3. Invertebrata.—*Insects, Bugs, &c.*—The harder kinds may be put in liquor, as above, but the vessel or bottles should not be very large. Butterflies, wasps, flies, &c., may be pinned in boxes, or packed in layers with soft paper or cotton. Minute kinds should be carefully sought under stones, bark, dung, or flowers, or swept with a small net from grass or leaves. They may be put in quills, or small cones of paper, one in each. They may be killed by immersing the bottles, &c., in which they are collected, in hot water, or exposing them to the vapor of ether.

It will frequently be found convenient to preserve or transport insects pinned down in boxes. The bottoms of these are best lined with cork or soft wood.

The traveller will find it very convenient to carry about him a vial having a broad mouth, closed by a tight cork. In this, should be contained a piece of camphor, or, still better, of sponge soaked in ether, to kill the insects collected. From this, the specimens should be transferred to other bottles.

Ether will be found most effective in killing all insects that cannot or ought not to be immersed in alcohol. All those that can support the immersion in this liquid without injury may readily be killed in this way.

The camphor should always be fixed in the box containing insects, as it would break the feet and antennæ of the latter if in a loose and crystalline state. It may be kept in a piece of muslin or canvas, and then pinned at the bottom of the box.

Marine shells, crabs, worms, sea cucumbers, star fishes, sea urchins, and polypes, should be put in spirit and in small vessels, so as to prevent too great pressure. Sea urchins and star fishes may also be dried after having been previously immersed for a minute or two in boiling water, and packed up in cotton, or any soft material which may be at hand.

The hard parts of corals, and shells of mollusca, may alone be preserved in a dried state. The soft parts are removed by immersing the animals for a minute or two in hot water, and washed clean afterwards. The valves of bivalve shells should be brought together by a string.

Spiders, scorpions, centipedes or thousand-legs, earth-worms, hair-worms, and generally all worm-like animals to be met in fresh waters, either clear and running, or still and putrid, cannot be better preserved than in the strongest alcoholic liquor, and in small bottles or vials.

§ IV. EMBRYOS.

Much of the future progress of zoology will depend upon the extent and variety of the collections which may be made of the embryos and fœtuses of animals. No opportunity should be omitted to procure these and preserve them in spirits. All stages of development will be equally interesting, and complete series for the same species are of the highest interest. Not only the domestic mammalia, as horse, cow, sheep, hog, dog, &c., should be collected, but also any of the wild animals, as deer, bears, wolves, foxes, antelope, and any and every species. Whenever any females of such mammalia are killed, the uterus should be examined for embryos, and the smaller or more minute, in many cases, the more interesting. When eggs of birds, reptiles or fish, are emptied of their young, these should be preserved. It will be sufficiently evident that great care is required to label the specimens, as in most cases it will be impossible to determine the species from the zoological characters.

§ V. NESTS AND EGGS.

Nothing forms a more attractive feature in a museum, or is more acceptable to amateurs, than the nests and eggs of birds. These should be collected whenever they present themselves, and in any amount procurable for each species, as they are always in demand for purposes of exchange. Hundreds of eggs of *any* species with their nests (or without, when not to be had) will be gladly received.

Nests require little preparation beyond packing so as to be secure from crumbling or injury. The eggs of each nest, when emptied, may be replaced in it and the remaining space filled with cotton.

Eggs, when fresh, and before the chick has formed, may be emptied by making a minute hole at each end, and blowing or sucking out the contents. Should hatching have already commenced, an aperture may be made in one side by carefully pricking with a fine needle round a small circle or ellipse, and thus cutting out a piece. The larger kinds should be well washed inside, and all allowed to dry before packing away. If the egg be too small for the name, a number should be marked with ink corresponding to a memorandum list. Little precaution is required in packing, beyond arranging in layers with cotton and having the box entirely filled.

The eggs of reptiles, provided with a calcareous shell, can be prepared in a similar way.

The eggs of fishes, salamanders and frogs, may be preserved in spirits, and kept in small vials or bottles. A label should never be omitted.

§ VI. SKELETONIZING.

Skulls of quadrupeds may be prepared by boiling in water for a few hours. A little potash, or ley, added, will facilitate the removal of the flesh.

Skeletons may be roughly prepared by skinning the animal and removing all the viscera, together with as much of the flesh as possible. The bones should then be exposed to the sun or air until completely dried. Previously, however, the brain of large animals should be removed by separating the skull from the spine, and extracting the contents through the large hole in the back of the head. In case it becomes necessary to disjoint a skeleton, care should be taken to attach a common mark to all the pieces, especially when more than one individual is packed in the same box.

Skulls and skeletons may frequently be picked up, already cleaned by other animals or exposure to weather. By placing small animals near an ant's nest, or in water occupied by tadpoles, or small crustacea, very beautiful skeletons may often be obtained. The sea beach sometimes affords rich treasures in the remains of porpoises, sharks, whales, large fishes, and other aquatic species.

§ VII. PLANTS.

The collector of plants requires but little apparatus; a few quires or reams of unsized paper, of folio size, will furnish all that will be required. The specimens, as gathered, may be placed in a tin-box, or, still better, in a portfolio of paper, until reaching home. Here they are to be spread out carefully between sheets of the paper, and these laid one on top of the other, with several sheets between each. The pile is now to be placed between two boards, and subjected to a pressure of fifty pounds or less. This may be given by weights, or by means of two straps, one at each end. In travelling, the straps will be found most convenient. The papers must be changed every day, and, when perfectly dry, transferred to fresh sheets. It will be found very convenient to have a number of blank labels, with strings attached, by which they may be fastened on a specimen when collected, as soon as notes of locality, color of flowers, date, &c., are made upon it.

In many instances, old newspapers will be found to answer a good purpose both in drying and in keeping plants, although the unprinted paper is best—the more porous and absorbent the better.

While on a march, the following directions for collecting plants, drawn up by Major Rich, are recommended:—

Have thick cartridge, or envelope-paper, folded in *quarto* form, and kept close, and even by binding with strong cord; newspapers will answer, but are liable to chafe and wear out; a few are very convenient to mix in with the hard paper as dryers. This herbarium may be rolled up in the blanket while travelling and placed on a pack animal. The specimens collected along the road may be kept in the crown of the hat when without a collecting-box, and placed in paper at noon or at night. Great care should be taken to keep the papers dry and free from mould. When there is not time at noon to dry the papers in the sun, they should be dried at night by the fire, when, also, the dried specimens are placed at the bottom of the bundle, making room on top for the next day's collection. A tin collecting-box is very necessary; plants may be preserved for two or three days in one if kept damp and cool. It is also convenient in collecting *land-shells*, which is generally considered part of a botanist's duty. A collector should also always be provided with plenty of ready-made seed papers, not only for preserving seeds, but mosses and minute plants. Many seeds and fruits cannot be put in the herbarium, particularly if of a succulent nature, causing mouldiness, and others form irregularities and inequalities in the papers, thus breaking specimens and causing small ones and seeds to drop out. Fruits of this kind should be numbered to correspond with the specimen, and kept in the saddle bag or some such place. It is necessary, in order to make good specimens, to avoid heavy pressure and keep the papers well dried, otherwise they get mouldy, turn black, or decay.

On board ship, it is all-important to keep the collections from getting wet with salt-water. The papers can generally be dried at the galley. The whole herbarium should be exposed to the sun as often as possible, and frequently examined, and the mould brushed off with a feather or camel's-hair pencil.

§ VIII. MINERALS AND FOSSILS.

The collections in mineralogy and palæontology are amongst all, those which are most easily made; whilst, on the other hand, their weight, especially when on a march, will prevent many from making such upon an extensive scale.

All the preparation usually needed for preserving minerals and fossils consists in wrapping the specimens separately in paper, with a label inside for the locality, and packing so as to prevent rubbing. Crumbling fossils may be soaked to advantage in a solution of glue.

Any fossil, whatever it be, should be collected. Minerals and samples of rocks are also desirable. The latter should be properly selected, and cut to five by three inches of surface, and one to two inches thick.

Specimens ought to be tightly packed up in boxes, taking care that each one is wrapped up separately, in order that the angles or crystalline surfaces should not be destroyed by transportation; their value depending upon their good condition. The same precautions will be required for corals. The interstices between the specimens, in the box or cask, may be occupied by sawdust, sand, shavings, hay, cotton, or other soft substance. It is absolutely essential, for land carriage, that no cavity be left in the vessel, or box.

§ IX. DESIDERATA.

As comparatively little is known of the animals and plants of the country west of the Mississippi and Gulf of Mexico, the attention of officers of the army, and others, is especially invited to this region. Of the fresh water fishes, trout, grayling, minnows, &c., little or nothing is on record; and the same may be said of the marine species. The reptiles, birds, smaller mammalia (squirrels, marmots, gophers, pouched rats, hares, &c.,) and all other animals, should also be carefully collected.

This region likewise abounds in fossil bones, teeth, &c., of the greatest interest, especially in those portions known as "Mauvaises Terres," or "Bad Lands," and occurring along the Missouri and its tributaries, White River, Milk River, Platte, Eau qui Court, &c. The banks and beds of these and other streams likewise contain rich treasures of fossil bones. Similar remains are to be looked for in all caves, peat bogs, alluvial soil, marl pits, fissures in rocks, and other localities throughout North America.

A list of the principal species of large North American animals is subjoined, with reference to the collection of skins, skulls, horns, and skeletons. For the purpose of having complete series in the different stages of age and sex, and for supplying other museums, it is desirable to have a considerable number of the skulls of each species. When possible, at least one skeleton should be procured. It must, however, be remembered, that a single tooth or bone of an animal, in the absence of anything more, will be of importance. Each specimen should, as far as practicable, have the approximate age, sex, and locality, distinctly marked on the bone in pen or pencil.

Human Races, civilized and uncivilized.
Buffalo.
Musk Ox.
Mountain Sheep, or Bighorn.
California Wild Sheep.
Sea Otter.
Common Otter.
Grizzly Bear.
White Bear.
Bears, other species.
Raccoon, especially from California.

Mountain Goat.
Antelope.
Elk.
Little Elk.
Moose.
Reindeer, or Carabou.
Black Tail Deer, of Rocky Mountains.
Black Tail Deer, of the Pacific.
Mule Deer.
White Tail Deer.
Deer, other species.
Beaver.
Prairie Dog.
Marmots.
Sewellel.
Hares.
Large Wolf, black, white, or gray.
Lobos Wolf.
Prairie Wolf.
Coyote.
Medicine Wolf.
Indian Dog.
Foxes, all species.
Badger.
Wolverine, or Carcajou.
Fisher.
Marten.
Panther.
Jaguar.
Ocelot.
Ounce.
Tiger Cat.
Wild Cat.
Lynx.
Civet Cat, or Bassaris.
Armadillo.
Peccary, or Mexican Hog.
Walrus, or Morse.
Seals.
Porpoises.
Dolphins.
Whales.
Manatee or Sea Cow.

Alligator.
Sharks, Stingrees, Rays, Devil Fish; teeth, jaws, and vertebræ.

Specimens of the following kinds, preserved in spirits, from all parts of North America, are particularly desired: Small Quadrupeds, as field mice, shrews, moles, bats, squirrels, weasels. Reptiles, as snakes, lizards, scorpions (so-called), frogs, toads, tree-frogs, and, above all, the salamanders, or lizards without scales, found in water, or under logs and stones, known by the various names of hellbender, young alligator, ground puppy, water puppy, &c. Fish of all kinds, such as the gars, perch, pike, sunfish, chubs, suckers, minnows, and other species.

Invertebrates in general, as crabs, crawfish, and crustacea in general, insects, worms, starfishes, shells, &c.

In addition to dried plants, it will be well always to gather seeds, acorns, nuts, pine cones, &c., which when sent in may be planted, and thus furnish important additions to Horticulture, as well as to Botany. They should be put up perfectly dry.

We have called especial attention to the country west of the Mississippi. Much is still to be done, however, in the east, and collections of any kind will be acceptable from all parts of the Continent.

§ X. GENERAL LIST OF APPARATUS.

We shall here present at one view a list of the principal apparatus and outfit required for collecting on the simplest scale, in the different kingdoms of nature. Fuller explanations of all will be found under their appropriate heads.

1. For Collecting.—Gun, with shot of various sizes, from buck to No. 10, as also the proper equipment of powder, percussion caps and wads. Rifle for large game.

Fishing rod and lines. The latter should be of different sizes, with a supply of extra hooks, and snoods.

Nets of various kinds; a seine of about seven feet long with a bag in the middle, will be found most useful for fish. Also a small pocket net for insects, &c., but strong enough for fishes. Some gauze nets for insects.

A casting net will be found useful in fishing.

Pocket vial for collecting insects when on a land exploration, and for small invertebrata when on the sea shore, or on the bank of a river or lake.

Pocket box lined with cork, for collecting insects which cannot well be immersed in spirits.

Larger boxes into which the contents of the preceding may be transferred.

A vial of ether, and

A few ounces of camphor, for killing insects, ether being used in the pocket vial and camphor in the box.

Insect pins of assorted sizes.

Blank labels of paper with strings, for plants and skins of animals.

Unsized paper for plants; a ream or more.

Portfolio with straps.

Labels of parchment for animals in liquids.

Hundred or more lino bags of various sizes.

Ten or more yards of lino.

India rubber bag.

2. For Preserving.—Knives.

Two pairs of scissors.

Needles and threads of various numbers.

Twine.

Hook with loop.

Arsenic (powdered), five or ten pounds put up in several tin canisters.

Corrosive sublimate (powdered), about half a pound.

Alcohol in a small keg or tin can.

Tartar emetic or ipecacuanha.

Alum.

Saltpetre.

Common salt. (The three latter substances will hardly be required with plenty of alcohol and arsenic.)

Cotton or tow.

On the Provincial Currency.

Read before the Canadian Institute, January 31st, 1853; by J. B. Cherriman, M.A., F.C.P.S., Fellow of St. John's College, Cambridge, and Deputy Professor of Mathematics and Natural Philosophy in the University of Toronto.

The evils consequent on the present state of our Provincial Currency are so flagrant, and their effects accumulating as our wealth and national prosperity increase, are also beginning to make themselves so severely felt, that the postponement of some change in the system, long ago acknowledged to be necessary, seems no longer possible. It is the object of this paper briefly to state the nature of the changes which can be made to remedy those evils, and to discuss the methods proposed or desirable for effecting such change.

It is evident that a currency ought to be regulated with reference to two distinct objects to be attained—first, to furnish the most easy and convenient mode of exchange from individual to individual within the country itself—secondly, to adopt a standard and notation, which may, as far as possible, fit into and cohere with the currencies of those countries with which our commercial relations are most intimate. The first will have regard mainly to the subdivisions of the unit chosen—the second, to the nature of the unit itself.

In considering the latter question, the countries whose currencies we have to look to are Great Britain and the United States; and a brief statement of the nature of the currency of each is necessary.

The Sterling Currency of Great Britain is based on a gold standard, namely, the £ sterling or the gold sovereign which contains 113 1-623 grs. of pure gold; this is taken to be equivalent to 20 shillings of silver, each shilling containing 80 8-11 grs. of pure silver; the shilling is again divided into 12 pence of copper and each penny again into four farthings, but the cop-

per coinage may be left out of consideration as of inferior importance.

In the system of the United States, since the year 1834, the unit adopted as standard is the Silver Dollar, contain 371¼ grs. pure silver, and this is subdivided into 100 cents of copper. The Gold Coin which is also in use, is the Eagle, containing 232 1-5 grs. pure gold, and fixed by law as the equivalent of 10 dollars.

In each case although the standard is ostensibly of one metal, gold in sterling and silver in the other, yet by reason of the existence of these fixed legal equivalents of coins of the other metal to the standard, it is plain that each country in reality uses a double standard. Now, Gold and Silver, being metals each possessing an intrinsic value, will always like other commodities have a market value relatively to each other, a value which is quite independent of legislative enactments, and rarely if ever coincides with that fixed by law: so that the ratio between the metals is by law said to be constant, while in fact it is perpetually varying, and in all double currencies of this kind, one metal is certain to be undervalued as compared with the other. Thus it was in France and England, towards the close of the 18th century: England over-valued gold, and France over-valued silver, and the effect was the disappearance of gold from France and of silver from England. The inconvenience resulting in this way does not appear to be capable of evasion altogether; its effects are somewhat obviated in sterling by the enactment that silver is not a legal tender to the amount of more than £2, and this confines the evil within small limits, and renders a change in the amount of metal contained in one of the coins necessary only at long intervals. How it will then be effected is not stated, but most probably it will be by altering the amount of silver in the lesser coins. In the United States, however, no such restriction exists, nor indeed could it exist so long as the small coin is the standard, for all large payments are made in gold and no legal limitation to the amount of tender could possibly be made. Here, therefore, the evil exhibits itself in its full effects, and the only remedy will be by successive enactments reducing the amount of gold in the Eagle—this has already occurred even in the short period that has elapsed since the construction of the federal coinage, namely, in 1834, when the Eagle was reduced from 247½ grs. of pure gold to 232 1-5, more than 15 grs., or about 6½ per cent. In this respect Great Britain seems to have a decided advantage over the States.*

"Before the discovery of the mines in America the value of gold as compared with that of silver seems to have varied in the different mines of Europe between the proportions of 1 to 10 and 1 to 12, but about the middle of the 17th century it came to be regulated at 1 to 14 or 15 from which it not has since varied much." In sterling an ounce of gold is worth a little more than 15 ozs. of silver, and in federal money, an oz. of gold is worth a little less than 16 ozs. of silver: it thus appears "that gold has been rising in its nominal value or in the quantity of silver exchanged for it: both metals have sunk in real value or in the amount of labour they could purchase,but silver has sunk more than gold." Whether the enormous discoveries of gold in Australia and California will check this downward tendency of silver is not easy to say.

The difference pointed out between the relative values of the two metals as regulated in England and America renders it difficult to institute a strict comparison between their respective coins. The £ sterling compared with the Eagle by means of the amounts of pure gold contained in each is worth $4 86⅔, which is its value as fixed by the United States Mint, and its legalized value is $4 84. Again, the sterling shilling compared with the silver dollar by the amounts of pure silver contained in each, should be worth 21.74 cents, while its legal value is 23 cents, and its mint value, calculated apparently on the English scale, is 24⅓.

With regard to the utility of each system for the convenience of internal traffic, the American is, without doubt, theoretically the most perfect that can be conceived, while the sterling subdivision of 4, 12 and 20 are about as awkward as can be. The sterling, however, has the advantage of possessing coins of more convenient amount, and embracing a larger range, the £ being much better than the dollar for large transactions, and the farthing more useful than the cent in retail trade. The reasons, however, which have caused the practical working of the American system to be so far removed from its theoretical perfection will be touched on bye and bye.

It is clear that the two systems cross each other in such an inextricable manner as to give no hope of accommodation between them, and the construction of any system to harmonize perfectly with both would be altogether an insane attempt; let us examine then how far our present Provincial Currency succeeds in the adaptation. I here speak of the Provincial Currency as established by the Acts 4th and 5th, 13th and 14th Victoria, and not of the various currencies of exchange in use in different departments, which it would be only a waste of time to enter into.

Our currency is subdivided by 20, 12, 4, starting from the £ with shillings, pence and farthings, thus adopting the sterling measure in its most objectionable part. The £ sterling is said to be the standard of value, and denominated £1 4s. 4d.: as the £ sterling might have been called by any other name, the denomination being quite arbitrary, it will be curious to examine the origin of this extraordinary number £1 4s. 4d. which is our unit. It appears to have taken its rise in the state paper-system adopted by the ancient British Colonies of America. "The paper currencies of North America, says Adam Smith, 'consisted, not in bank notes payable to the bearer on demand, but in a government paper, of which the payment was not exigible till several years after it was issued; and though the colony governments paid no interest to the holders of this paper, they declared it to be, and in fact rendered it, a legal tender of payment for the full value for which it was issued. But allowing the colony security to be perfectly good, £100, payable for example 15 years hence in a country where interest is at 6 per cent., is worth little more than £40 ready money. To oblige a creditor, therefore, to accept of this as full payment of a debt of £100 actually paid down in ready money was an act of such violent injustice as has scarce, perhaps, been attempted by the government of any other country which pretended to be free."

Of course this ingenious "scheme of fraudulent debtors to defraud their creditors," as Smith calls it, failed as all legislative interference with the natural laws of trade must fail, and in course of time the exchange with Great Britain varied so widely that £100 sterling came to be considered the equivalent in some colonies of £130, and in others of so great a sum as £1100 currency, this difference in the value arising from the difference in the quantity of paper emitted in the different colonies, and in the distance and probability of the term of its final discharge and redemption.

Another instance I will quote from the same authority.

The colony of Pennsylvania, before any emission of paper money, had raised the denomination of its coin and had, by act of assembly, ordered 5s. sterling to pass in the colonies for 6s. 3d., and afterwards for 6s. 8d. The pretence for doing so was to prevent the exportation of gold and silver, by making equal quantities of these metals pass for greater sums in the colony than they did in the mother country. It was found, however, that the price of all goods from the mother country rose exactly in pro-

* Since the above was written a Bill has passed the United States Senate, assimilating the practice of the States in this respect to that of Great Britain, and in effect abandoning the silver standard.

portion as they raised the denomination of their coin, so that their gold and silver were exported as fast as ever."

At length the course of exchange was fixed at £90 sterling for £100 currency, and this constitutes the bank par, the actual exchange being adapted to this by the addition of a premium, which has gradually risen to about $10\frac{1}{2}$, from which it will not probably vary much in future. Taking the premium at $9\frac{1}{2}$, that is, £90 stg. for £$109\frac{1}{2}$ currency, we have the value of £1 stg. to be £1 4s. 4d., nearly, which is now its legal value.

Taking the sterling standard of silver coin from our gold unit we find the crown or 5s. exactly 6s. 1d.

$\frac{1}{2}$ Crown	3s. $0\frac{1}{2}$d.
Shilling	1s. 2d. 3-5ths.
Sixpence	0s. 7d. 3-10ths.

and these are also their values fixed by law except that the shilling and sixpence are made equal to 1s. 3d. and $7\frac{1}{2}$d. for sake of convenience.

Turning to the United States money, we find the Eagle current at £2 10s., which is its correct value, as compared with the Sovereign; and, taking the American relation of silver to gold, this would make the dollar exactly 5s.; or, taking its value as compared with the current value of British silver, it would be worth about 5s. 7d.: we find it actually set down as legal tender for 5s. 1d.; the half-dollar for 2s. $6\frac{1}{2}$d., and so on, the quarter being diminished to 1s. 3d., and the $\frac{1}{8}$th of the dollar to $7\frac{1}{2}$d. The cause of this strange anomaly I am quite unable to discover, but the effect of it is to keep both British and American gold out of circulation, 20s. stg. going further than £1 stg., and 10 dollars going further than the eagle: in like manner, the sterling shilling and six-pence being conventionally raised relatively to the crown and half-crown, and the American $\frac{1}{4}$ dollar and lower divisions being lowered relatively to the dollar and $\frac{1}{2}$ dollar, it follows that the circulation of crowns, half-crowns, and the American $\frac{1}{4}$ dollars and lower coins will be materially retarded.

I remarked before that any attempt to reconcile the two currencies of Great Britain and the United States, would be hopeless: it only remains then to discard our Provincial notation and adopt one or other of these, with or without modifications. Two proposals have lately been made—that of Sir John Pakington, which was in effect, to coin for us sterling monies under our present current denominations, such as seven-pence half-pennies, one and three-pennies, and so on: this, stereotyping our present absurdities, may be rejected at once: the other, was the bill passed in the Provincial Legislature last year, and disallowed by the Home Government for ostensible reasons which need not here be discussed. This bill proposed simply that the £ sterling, as determined by the United States' mint at \$4. $86\frac{2}{3}$, should be as at present, denominated £1 4s. 4d. currency, and that of the £ currency thus defined, one-fourth part should be called a dollar, which should ever after be taken as the unit of monies, the dollar being divided into one hundred cents, and all monies and coins being determined by the proper proportion of their value to this value of the dollar. This proposal is undoubtedly simple, clear and concise, being a great step in the right direction: in fact, it would amount to adopting the American system in its entireity, both standard and notation. But, it may be remarked, in the first place, that an entirely new coinage would be required, as sterling money would no longer pass at the rates of American money, even conventionally as at present, and to this it is not likely the British mint will consent. Secondly, that the American notation should serve us both as an example and a warning; the inconvenience felt in the practical currency of the United States, arises from the circumstance of their having retained the old coins along with the new denominations, and not having insisted strongly enough on the division of the dollar into tenths or dimes. Thus the quarter dollar is not an exact number of dimes, and the York-shilling and the sixpence not even an exact number of cents; these coins ought to have been withdrawn altogether from circulation; the division should have run, not only in theory but in practice, 10 cents, 1 dime—10 dimes, 1 dollar, and no coin should fall between the cent and dime which is not an exact number of cents, nor any between the dime and dollar not an exact number of dimes. In fact, the people should have been made to count by tens upwards, instead of downwards, by halves, quarters, eighths, and sixteenths. This precaution was not taken in the bill in question, and if it had been, would still more strongly have necessitated the use of new coins: probably they would have been the dollar, the five-dime piece, or half-dollar, a two-dime piece, the dime, and the cent.

There is one remaining system to be examined, and to this I would beg to direct especial attention: it is the system proposed to be adopted for a decimal division of sterling, recommended by a commission of the best scientific men in the kingdom, and which will probably be carried out in a few years in its integrity, under the superintendence of the great Sir John Herschel. In this division the £ sterling will contain ten florins, the florin ten-pence, and the penny ten farthings, so that the currency will consist of the following coins:—The pound of ten florins, or the sovereign; the five-florin piece, or half-sovereign; a two-florin piece, and the florin itself. The only new coin here required is the double-florin, and this will probably be issued as soon as the withdrawal from circulation of the crown and half-crown, already begun, is completed.

The divisions of the florin will be the five-penny piece, which is the present shilling sterling, the two-penny piece, for which the dime might pass, and the penny ; with the latter, some practical difficulty exists, for being equal to two-pence two-fifths of the present sterling, it would be too large for a copper coin, and too small for silver. Three methods have been suggested for obviating this difficulty—the first proposes to make a coin of a convenient size of a proper alloy of silver and copper; the second to have a copper coin with a central disk of silver; and the third to make the coin of silver, with a hole in the centre: any of the three methods would probably do.

For the divisions of the penny it would be sufficient to have the farthing and a five-farthing piece, or half-penny: the farthing being then the thousandth part of the pound, instead of one nine-hundred and-sixtieth as at present, and nearly the same as half a cent.

This system, then, is complete in all its parts, more useful than the federal money, because embracing a larger range, the pound being as much more useful than the dollar in large transactions as the farthing than the cent in small, and every coin being an exact multiple of the lower denomination.

In the adoption of this currency by Canada, there seems to be no difficulty in the way; all current sums would be turned at once into sterling at the current rate, and after the trouble of the first step, no fresh vexation would occur. There is little fear that the mint would object to it, and the Province would have the honor of outrunning the mother country in effecting perhaps the greatest commercial reformation that has been made in moderntim times.

The changes, which are here discussed with reference to money merely, apply with still greater force to the numerous weights and measures which are used both here and elsewhere. The anomalous and annoying divisions that occur in every department, have long been a theme for scientific indignation; but a reformation of these will perhaps only be brought about at long intervals. What was done in France at a single blow, will with us be the work of a longer but not less certain process: the guinea of 21s. has at last disappeared—the score of 25, and the

dozen of 13, only linger in some rural corners; the cwt. of 112 lbs. is fast giving way before the legitimate claimant of that title, and the Bank of England has just taken one important step, which will be followed by many others, in announcing their intention to use hereafter only weights which are decimal multiples of the Troy grain.

These facts give us hope that some day or other our children's children may be saved the irksome labour that our childhood underwent, and an arithmetic book of the present day be regarded by them as a useless curiosity.

The Horse and its Rider.

BY J. BAILEY TURNER, ESQ., QUEBEC.

It is thought that wild horses existed in Europe, but that among the Celtic tribes the domesticated horse was not known until about the period that the Celtic-Scythian Gauls ascended the Danube and crossed the Rhine, and that it was introduced into England by the Phœnicians, who were the means of bringing many Eastern customs and commodities into the land with which they traded. Now we know that the Celtic tribes in France were horsemen, for Pausanius tells that they used in their armies the trimarkesec, or well-known trinal arrangement of a knight and his two squires, while in Britain, at the time of Cæsar's invasion, the natives fought in chariots; the Gallic Celts therefore followed more the custom of Northern Asia, and the British Celts that of Southern Asia.

It has been commonly believed and asserted, that astronomical observations were first made in Egypt, and that there the Zodiacal belt was divided into its twelve horses; but it has now been satisfactorily shown, that the zodiacal constellations were named in some country more northerly either than India or Egypt, therefore before the civilization of either, or the introduction of the domesticated horse; and that as in the houses of the sun, the horse is not placed, we may take that as an indication that that animal was already used as a type of the moving power of the sun, and as a personification of that luminary, by the nation to whom we may attribute the division of the zodiac; some riding nation of Central Asia. Among all the riding nations the horse, or the name of the horse, was used to express beauty, power and exaltation; and in the earliest annals of the Persians, the various names of that animal are not only titles of the sun, but of kings and great lords: as *Var*, in Varanes; *Phar*, in Pharnabasus; *Asp*, in Lorasp. The same practice prevailed among the Gothic nations, where we find Hengist, Horsa, Uppa, and Bayard, all names of the horse, applied to princes and chiefs. It is probable that superstitious veneration was first applied to the horse in Egypt, Arabia, and the neighbouring countries, at about the period of the first Scythic invasions; for we find that some of the tribes of idolaters by whom the Jews were surrounded in Palestine worshipped gods in the form of horses. The kings of Judah themselves were often polluted by this worship, for we read that the pious Josiah took away the horses that the kings of Judah had given to the sun, at the entering in of the house of the Lord. In Europe, a black horse was long considered a form of the evil one. Among many of the Pagan Asiatic tribes at this day, their magic ceremonies are performed with small images of horses; and the very Mahometans, to whom "the likeness of anything that is in heaven above, or in the earth beneath, or in the waters that are under the earth," is an abomination, admitted a kind of semi-idolatrous worship of the horses of two of the great heroes of Islam, Hosein and Khizr. Our own Teutonic ancestors sacrificed horses to the sun, Ertha, and other divinities, in their temples on the Island of Rugen. All the sun-gods, wherever worshipped, by whatever people, under whatever name, had studs of sacred horses, either to draw their idol chariot, or to be led in solemn procession before its shrine; such were those of the Persian Ozmusd, snow-white, and bred for the service of the temple in Cilicia. In every temple of the sun, in every sacred grove, from the Baltic to the Ganges, there were stalls for the holy horses. The horse has been everywhere the type of victory, the national emblem, the standard of battle—either by the exhibition of its skull, or its tail, or by the whole image of the animal. Who has not heard of the white horse embroidered on the banners of our Saxon ancestors? To this day, once in each year, the whole peasantry of the neighbourhood meet to clear the weeds and grass from the surface of a huge white horse, extending over more than an acre, cut deeply into the face of a chalk hill, near Letcombe Regis in Berkshire, supposed to have been so cut in commemoration of a great victory gained by Alfred the Great over the Danes, under Offa, in the year 871.

> "Carved rudely on the pendant sod is seen.
> The snow-white courser stretching o'er the green;
> The antique figure scan with curious eye,
> The glorious monument of victory.
> Then England reared her long dejected head,
> Then Alfred triumphed and invaders fled."

Other traditions, however, affirm that this singular antiquarian relic is of much older date than Alfred, and was intended to represent the white-horse of Hengist; to this day, the tail of a white horse, with the ends of the hair dyed red, and fixed to the end of a lance, is the standard of the Mahometan cavalry: it has replaced over all Islam the white banners of the Ommiades and the black ones of the Abassides.

The great object hitherto has been to ascertain the original habits of the horse in its wild state, the race of mankind by whom it was first subjugated to man's use, and its probable first introduction to what are commonly known as civilized countries. I shall now proceed to notice a few other facts with respect to this animal, as known to and used by the ancients, and trace its history to our own time. Proceeding to other countries in the neighbourhood of Egypt and Arabia, we learn from Herodotus that the Babylonians had vast numbers of horses. He speaks of a certain satrap, or lord, of their country, by name Tritantæchmes, as owning, in addition to his war horses, 800 stallions and 16,000 mares. The same author also notices the numerous cavalry of the Bactrians and Caspians, and tells us, that though the quadrupeds and birds of what is now British India far exceeded in size those of other countries, the horse was an exception, for it was far surpassed by a peculiar breed in Media named the Nisean. Ten horses of this breed, superbly caparisoned and of extraordinary size, drew the chariot containing the idol of Jupiter, in the train of Xerxes during his expedition into Europe. At this day the horse of Hindostan, of the native breeds, is a very inferior animal; and we learn from Col. Sykes, that the only firm, well-made horses in the country are the result of repeated crossing with the best blood of Arabia and Persia: and latterly the importation of English blood has done much to improve the race. Major Gwatkin, the Superintendent of the East India Company's breeding stud in Northern India, describes the original Indian mare, as very inferior in shape, and generally a jade with narrow chest, drooping mean quarters, and if above fourteen and a half hands high, much too leggy. Just such as Major Gwatkin describes them, are the sculptured horses wherever met with in India, showing that what the native horse is now, it has been from the earliest times. It does not appear that the Babylonians, any more than the Persians and Greeks, at or about the time of Homer, were accustomed to ride on horseback. All the heroes of the Iliad are depicted as fighting in chariots; and chariots alone are found sculptured on the basso-relievos of Persepolis. Late discoveries in the ruins of ancient Ninevah lead us to suppose, that the Medes were accustomed to ride on horseback at a much earlier period; for Mr. Rich speaks of a basso-relievo of a

mounted warrior, and of the figure of a riding sportsman, catching a deer with a casting-net, found in the ruins of that city. As I before observed, saddle-horses do not appear to have been much used in South-Western Asia; for, on the authority of Herodotus, Cyrus opposed camels to the Lydian Cavalry of Crœsus. After this time it is probable that the Persian sovereigns availed themselves of the services of various equestrian tribes from the higher Asiatic regions, coming through the passes of the Western Caucasian range, along the coast of the Caspian; for from the time of Cyrus we find cavalry invariably mentioned as forming a part of the Aramean legions, and in various parts of Persia they are found in the sculptures of a later period. I before observed, that though by the express command of God, the Israelites were forbidden to use horses, Solomon broke the command, and imported both horses and chariots from Egypt. In the First Book of Kings, chapter x., verse 29, we have the record of exactly what he paid for them: reduced into English sterling, each horse cost about £17, and each chariot about £68. The trade was evidently carried on by the gross or string, as the price was not for different values of single horses: and from the same record we learn another important fact, that in Phœnicia horses were either dear or scarce, for Solomon, after supplying the armies of Israel, traded in horses with the Phœnicians. The Tyrians, another mercantile people of great renown, imported horses from Armenia, and carried them to their colonies in Africa, to Crete, Sicily, Spain, and Greece. Thus may have arisen the old Greek fable, that Neptune, the god of the sea, produced the horse by striking the earth with his trident. It was also the belief of the Circassians, that the Shalokh, the noblest of the Cabarder breeds, sprung from the sea; probably because in either case the parent stock was imported by water. There is another mythological curiosity about the horse. As the camel was styled, by the camel-riding tribes of Arabia, the ship of the desert—so was the ship styled, by the Celto-Scythians, the horse of the sea. Hence, under the names of the horse and mare, were typified in the Druidical worship, the helic and lunar arkite enclosures, a worship and a mystery which would of themselves form the subject of a lecture; hence the Eastern mythological fables of Perseus and Bellerophon.

It was the opinion of Buffon, the great French naturalist, that Arabia had no horses in the early ages, nor even at the commencement of the Roman Empire, and hardly any at the date of the Mahometan Hegira. He supports this opinion by the fact, that 200 years after the Christian era, horses were sent as a present to the Arab princes; and that 400 years after, one of the Roman emperors sent 200 Cappadocian steeds to the same country; while in the 7th century, Mahomet had but two horses in his army, when he fought with the Koreish, and did not capture a single horse in his victorious campaign. But, admitting the truth of the first two facts, as stated by Buffon, the argument by no means holds good in the case of Mahomet. Mecca and Medina were in the midst of the Edomite Arabs, then, and to this day, for the most part a camel-riding tribe; but this by no means proves that the northern tribes, the Bedoueens and the clan of Yemen had no horses. The land of the Edomite Arabs has no pasturage whatever for horses, nor does it grow the golden barley, the food with which the Arab of Yemen delights to feed his favourite mare. On the authority of Laborde, the Edomite speaks with envy and admiration of the glorious chargers of his brethren the equestrian Arabs. Robber by profession, what could the Arab do without a horse? Long before the fall and destruction of Jerusalem by Titus, bands of Jews, stray remnants of the captivity of Sennacherib, of the tribes of Gad and Manasseh, had taken to the desert, and adopted Arab customs and means of subsistence; under a succession of their native princes, they exercised a nomade warfare, fought great battles, captured Mithridates, and utterly defeated a Persian army, entirely composed of horsemen. And what after all was Abraham, the father of Isaac and Jacob and the patriarchs, but an Arab Sheik, an Arab of the Arabians? In revenge for this defeat, a fearful massacre took place among the Iranese Jews, and whole families of them, flying from the slaughter, took refuge in the tents of Yemen, where they became *Matnoub*, a term denoting the concession by the host to the guest to pitch the tent on the same line; and in return for the hospitality, some years after joining their sabres to those of their Arab hosts, they in one day prostrated the Parthian empire on the field of Kadesiah. That the Arabs had horses at the commencement of the Cæsarian Era, we know from the work of Hirtius on the wars of Alexander; for he says expressly, that Cæsar sent to Malchus, that is Melek, for a reinforcement of cavalry; while a little later, but still before the time of Mahomet, we hear of a war between two tribes, that lasted forty years, on account of a horse-race. Better evidence still is found in ancient Arabian poems, once suspended in the Kaaba, all dating before the time of Mahomet, which in animated and glowing terms speak of the horse and its qualities, give splendid pictures of cavalry battles, and notices which prove that those who wrote them had derived from their ancestors a noble breed of horses. Nay, if with many of the commentators, we take the Book of Job to have been written before the time of Abraham, and that Job was an Arabian or Idumæan prince and prophet, what shall we say to his description of the horse and his rider, "Hast thou given the horse strength? Hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? The glory of his nostrils is terrible. He paweth in the valley and rejoiceth in his strength; he goeth on to meet the armed men. He mocketh at fear, and is not affrighted, neither turneth he back from the sword: the quiver rattleth against him, the glittering spear and the shield. He swalloweth the ground with fierceness and rage, neither believeth he that it is the sound of the trumpet. He saith among the trumpets, Ha, ha; and he smelleth the battle afar off; the thunder of the captains and the shouting." A passage probably one of the most sublime ever written, and which could have been written by no man not well acquainted with the character of the animal, particularly when employed in warfare. It is a valuable passage also, because it shows that the horse was known in Arabia before it was in Egypt, and was then used by riders in war, as we have seen that the horse was not known in Egypt in the time of Abraham. Again, as to Mahomet, however badly provided with horses he may have been at the outset of his career, we find that in repeated passages of the Koran, he inculcates on his followers the utmost respect for the useful qualities of the animal. In one remarkable passage these words occur: "Thou shalt be for man a source of happiness and wealth; thy back shall be a seat of honor and thy belly of riches; every grain of barley given to thee shall purchase indulgence to the sinner."

Let us also remember what the Arabians were, and what they afterwards became, when to their original love of adventure and disposition for conquest was added the fierce spirit engendered by religious enthusiasm; but no mere enthusiasm could have effected the transfer of simple herdsmen into the best, the most daring cavalry of their time, or indeed of any time; have enabled them to destroy the vast mounted armies of the Persians, or encounter on equal terms, on many a field, the scientific discipline of the eastern empire, and in little more than 100 years after the prophet's death, given wings to the sword of Islam, and carried its green standard from Arabia to India in one direction, and France in another. In the year 631 Mahomet died: 366 years after, so great was the increase of his followers, that we find the horsemen of Islam numbered by the hundred thousand. When Mahmoud, the Gaznevide Sultan, the conqueror who carried away the sandal-wood gates of the temple of Somnauth, at Guzerat in Hindostan, and placed them at Cabool, whence they

were borne back in triumph by an Anglo-Indian army, in the memory of every one who listens to me; when this Mahmoud was about starting on one of his twelve expeditions to India, he demanded of Ismael, a tributary Seljukian chief, who dwelt in the territory of Bokhara, "How many men he could furnish for military service?" "If you send," replied Ismael, "one of these arrows into our camp, fifty thousand of your servants will mount on horseback." "And if that number," continued Mahmoud, "be not sufficient?" "Send this second arrow to the horde of Balik, and you will find fifty thousand more." "But," said the Gaznevide monarch, "If I should stand in need of the whole force of your kindred tribes?" "Despatch my bow," was the last reply of Ismael, "and as it is circulated around, the summons will be obeyed by two hundred thousand horsemen." Such was the progress made by this race, in numbers and power, that after the overthrow of the Gaznevide dynasty by the Seljukian Turcomans, we find them, in the year 1050, attacking the Roman Empire in the East. Gibbon says, that the Empire was assaulted by an unknown race of barbarians, who united the Scythian valour with the fanaticism of new proselytes, and the arts and riches of a powerful monarchy. The myriads of Turkish horse overspread a frontier of six hundred miles from Tauris to Arzeroum, and the blood of 130,000 Christians was a grateful sacrifice to the Arabian Prophet. Only about 250 years before this, in the year 721, the Riding nations, the followers of the false prophet of Mecca, had possessed themselves of the whole southern shore of the Mediterranean, from Palestine to the pillars of Hercules; had crossed over into and conquered almost the whole of the Spanish Peninsula, and advanced into France so far as Tours, when in one of the decisive battles of the world, the conflict of Tours, the Mahometans were utterly routed by Charles Martel. The fight lasted for seven days, and the contemporaneous historians declare that 350,000 of the Mahometan invaders perished on the field, under the iron maces of the gigantic Teutons, brought by Martel from beyond the Rhine to aid the Frankish Monarch. From the Hegira, almost to this day, this restless race of horsemen has troubled the Christian world, whether under the name of Arab, Moor, Turk, Turcoman or Ottoman, the last bloody repulse having been given to them by John Sobieski under the walls of Vienna in 1663. As we shall see hereafter, the history of this race is most intimately connected with that of the horse—Arabia being the country in which that animal, until very modern times, has attained the highest standard of excellence. With respect to this nation of horsemen—the Saracens and their successors, the Turks and the Ottomans—there are some most extraordinary prophecies in the Revelations of St. John; and so perfectly borne out by the event, that it may not be out of place to notice them. The words of the prophecy are these:—"And there came out of the smoke locusts upon the earth—and unto them was given power, as the scorpions of the earth have power—and it was commanded them that they should not hurt the grass of the earth, neither any green thing—neither any tree—but only those men who have not the seal of God in their foreheads—and to them it was given that they should not kill them, but that they should be tormented five months." A verse or two after, the sacred writer continues:—"And the shapes of the locusts were like horses prepared unto battle, and on their heads were as it were crowns like gold—and their faces were as the faces of men—and they had hair as the hair of women—and their teeth were as the teeth of lions—and they had breast-plates, as it were breast-plates of iron—and the sound of their wings was as the sound of chariots of many horses running to battle." "One woe is past, and behold there come two more woes hereafter." And then we have the further description: "And the number of the army of the horsemen were two hundred thousand—and I heard the number of them—and thus I saw the horses in the vision, and them that sat on them—having breast-plates of fire, and of jacinth and brimstone—and the heads of the horses were as the heads of lions, and out of their mouths issued fire and smoke and brimstone—by these three was the third part of men killed by the fire, and by the smoke, and by the brimstone which issued out of their mouths."

The locusts spoken of in the introductory verse allude, without doubt, to the clouds of Saracen horsemen which, like those insects in number and in the ravages which they made, overspread the whole boundary of the Roman Empire in the East for upwards of 150 years. The prophecy with respect to the green grass, the green things and trees, that no one should do them any injury, was most remarkably verified; for the Caliph, Hassan Abubeker, the successor of Mahomet, when his army was about to start on the Persian campaign, issued an order to his army in these words:—"Destroy no palm trees, nor burn any fields of corn; cut down no fruit trees, nor do any mischief to cattle, only such as you kill to eat." The order concludes:—"You will find another sort of people that belong to the synagogue of Satan, who have shaven crowns, be sure you cleave their skulls." The Bedawee followers of the prophets especially detested monks. The five months during which this torment was to last, may be explained in two different ways—five prophetic months are exexactly 151 years, or it may mean the five months of each summer, during which the supply of forage in the field enabled large armies of cavalry to be kept in motion. The crowns like gold, may refer to the superb jewelled turbans, invariably worn by the Saracen warriors; their faces are described as being like the faces of men—that is, fierce and bearded, while their long hair was carefully preserved, and plaited like the hair of women. Their breast-plates were like breast-plates of iron—an evident allusion to the shirts of bright steel mail universally worn by the Saracen and Turkish cavalry, to be seen to this day on the persons of the Circassian and other Eastern horsemen. The sound of their wings as the sound of many chariots, is a most poetic and graphic description of the noise which accompanies the rapid advance of a large body of cavalry. The vast numbers of the Saracen and Turkish hordes is expressed by the indefinite expression, "two hundred thousand thousand." Scarlet, blue and yellow, fire, jacinth and brimstone, have ever been the favourite colours of the sons of Islam. The fire, smoke, and brimstone which issued out of their mouths, by which the third part of men were slain, may, and doubtless does, allude to the fire-arms, their coming into general use, and which the Ottoman Turks constructed of unusual size.

(To be continued.)

Observations on the Leafing and Flowering of Plants.

It is exceedingly desirable that a system of observations should be established throughout Canada, similar to those which are now being carried on with such curious results in the neighbouring States, having for their object the leafing and flowering of plants. The Canadian Institute would be glad to receive from any of their members or others, any assistance in the shape of observations that they may be able to afford; the more numerous the observers, the better results may be expected, as it is only by comparing several observations from different places, that errors and variations arising from locality may be eliminated. In order to assist those who may be willing to commence such observations, the following list of native and naturalized plants has been prepared, containing principally those which are to be found in the neighbourhood of Toronto, and only those which are sufficiently common to be readily observed. The times of flowering have been added, as far as known to the writer, they may of course vary slightly. The list is by no means a complete one,

many common plants, especially of the compositæ and umbelliferæ, being omitted.

In observations on plants grown in gardens, it is necessary to exclude all annuals, as their periods of leafing and flowering vary so much, that no conclusions could be drawn from them, unless the portions of the same seed were sown on the same day. No plants which have been protected in any way, are available for these experiments, nor are those which exist in many varieties.

For the foliation, it is best to observe when the first leaves burst the bud, and when the upper surface first becomes exposed to the light.

For flowering, it is advisable to take the moment when the anthers become visible, and for the fructification, the dehiscence of the pericarp, or in cases of indehiscent fruits, the evident arrival of the seed carpel at maturity, may be taken as the dates to be noticed.

It would also be well to observe the period of defoliation, that is when most of the leaves have fallen.

Another subject, deserving of attention, is the periods at which early and late frosts occur, of sufficient intensity to effect any material injury to plants or vegetables; such, for instance, as the Dahlia and the Tomato, which are, perhaps, of all, the most sensitive to the influence of cold.

In connection with this subject, it would be of considerable interest to make observations on the arrival and departure of the various summer birds, insects, reptiles and animals.

PLANTS TO BE OBSERVED AS TO THEIR TIME OF LEAFING.

		flowers in
Acer Saccharinum	Sugar Maple	April.
Acer Rubrum-	Red Maple	March.
Œsculus Hippocastanum	Horse Chesnut	June.
Juglans Cinerea	Butternut	May.
Betula Papyracea	Birch	April.
Juglans Regia	Black Walnut	May.
Carya Alba	Shell-bark Hickory	"
Carya Amara	Bitter Hickory	"
Liriodendron Tulipifera	Tulip Tree	June.
Ulmus Americana	White Elm	April.
Fagus Ferruginea	Beech	May.
Corylus Americana	Wild Hazel	April.
Carpinus Americana	Iron Wood	"
Pinus Pendula	Larch	
Fraxinus Americana	White Ash	April.
" Sambricifolia	Black Ash	"
Rhus Typhina	Sumach	June.
Populus	Poplar	
Quercus	Oak	
Salix	Willow	
Sambucus Canadensis	Elder	June.

Among plants usually cultivated in gardens, the following may be observed as to their time of foliation:—

Mezereon.	Quince.
Double-flowering Almond.	Peach.
Lilac.	Double-flowering Peach.
Gooseberry.	Ailanthus.
Black Currant.	Abile.
Red Currant.	Honeysuckle.
Raspberry.	Linden.
Apple.	Mountain Ash.
Pear.	Spiræa.
Plum.	

WILD PLANTS TO BE OBSERVED AS TO THEIR TIME OF FLOWERING.

Ranunculus Bulbosus	Buttercup	May.
" Acris	Tall Crowfoot	June.
" Aquatilis-	White Water Crowfoot	June.
Trifolium Pratense	Red Clover	
" Repens	White Clover	
Fragaria Virginiana	Strawberry	
Cnicus Arvensis	Canada Thistle	
Erythronium Americanum	Dig-tooth Violet.	
Dirca Palustris	Wickaby	
Rubus Odoratus	Dog Rose	
" Occidentale	Black Raspberry	
Prunus Virginiana	Black Cherry	
" Borealis	Red "	
Cratœgus Coccinea	Thorn	
Ribes Floridum.		
Ribes Cynorbati.		
Trillium Pictum	White Death Flower	
Leontodon Taraxacum	Dandylion	
Lillium Canadensis	Orange Lily	
Arum Atropurpureum.		
Anemone Nemorosa	Wind Flower	April.
" Virginiana	Tall Anemone	June.
Hepatica Triloba	Three-lobed Liverleaf	March.
" Acutiloba	Sharp-lobed "	"
Thalictrum Divicum	Early Meadow Rue	April.
Caltha Palustris	March Marigold	"
Coptis Trifolia	Gold Thread	May.
Aquilegia Canadensis	Columbine	"
Actœa Alba	White Baneberry	"
Podophyllum Peltatum	May Apple	May.
Nymphæa Odorata	White Waterlily	July.
Nuphar Luteum	Yellow "	"
Sarracenia Purpurea	Pitcher Plant	June.
Sanguinaria Canadensis	Blood Root	April.
Nasturtium Palustris	Marsh Cress	June.
Dentaria Diphylla	Toothwort	May.
Capsella Bursa Pastoris	Shepherd's Purse	April.
Viola Pubescens	Yellow Violet	June.
Parnassia Palustris	Grass of Parnassus	July.
Hypericum Perforatum	St. John's Wort	June.
Elodea Virginica	Marsh "	July.
Silene Noctiflora	Night Flowering Catchfly	June.
Stellaria Media	Chickweed	April.
Portulacca Oleracea	Parslane	July.
Claytonia Virginica	Spring Beauty	April.
Impatiens Fulva	Touch me Not	June.
Rhus Toricodendon	Poison Ivy	June.
Ampelopsis Quinquefolia	Virginia Creeper	July.
Polygala Pauciflora	Milkwort	May.
Supinus Perennis	Supine	
Comarum Palustre	Marsh Cinque-Foil	June.
Potentilla Anserina	Silver Weed	April.
Amelanchier Canadensis	Shad Bush	April.
Epilobium Coloratum	Purple-veined willow herb	July.
Œnothera Biennis	Evening Primrose	June.
Mitella Diphylla	Mitre Wort	May.
Fiarella Cordifolia	False Mitre Wort	April.
Aralia Nudicaulis	Sarsaparilla	May.
Cornus Canadensis	Dwarf Cornel	May.
Linnæa Borealis	Twin Flower	June.
Diervilla Trifida	Bush Honeysuckle	June.

Mitchella Repens	Partridge Berry.	
Astir(?)		
Solidago(?)	Golden Rod.	
Gnaphalium(?)	Cudweed.	
Lobelia Syphilitica	Great Lobelia.	
" Inflata	Indian Tobacco.	
" Kalmii.		
Gaultheria Procumbens	Winter Green	May.
Epigœa Repens	Trailing Arbutus	April.
Pyrola Rotundifolia	Round Leaved Pyrola	July.
" Secunda	One Sided Pyrola	July.
Chimaphila Umbellata	Prince's Pine	June.
Tricutalis Americana	Starflower	May.
Lysimachia Ciliata	Loosestrife.	
Utricularia Vulgaris	Bladder Wort	June.
Verbascum Thapsus	Mullen	June.
Mimulus Ringens	Purple Monkey Flour	August.
Veronica Beccabunza		June.
" Peregrina		April.
Gerardia Guercifolia	False Fox Glove	August.
Castilleja Coccinea	Scarlet Painted Cup	May.
Pedicularis Canadensis	Louse Wort	May.
Verbena Hastata	Blue Vervain	July.
Mentha Canadensis	Wild Mint	July.
Scutettaria Galericulata	Skullcap	August.
" Paroula	Small do.	May.
Lithospermum Canesceus	Hoary Puccoon	May.
Datura Stramonium	Thorn Apple	July.
Gentiana Ptheumonanni	Marsh Gentian	August.
Menyanthes Trifoliata	Buckbean	August.
Asclepias Cornuti	Milkweed	July.
Phytolacca Decanda	Pope Weed	July.
Shepherdia Canadensis	Buckthorn	May.
Symplocarpus Fœtidus	Skunk Cabbage	April.
Alisma Plantago	Water Plaintain	July.
Sagittaria Variabilis	Arrow Head	"
Vallisneria Spiralis		August.
Cypropedium Spectabile	Lady's Slipper	July.
Smilacina Bifolia	Two-leaved Solomon's Seal	May.
"	Great Solomon's Seal	May.
Clintonia Borealis		June.
Noularia Perfoliata	Bell Wort	May.

CORRESPONDENCE.

Reply of the Provincial Secretary on the part of His Excellency the Governor General to the Memorial of the Canadian Institute, for the continuance of the Magnetical Observatory at Toronto under Provincial management:

Secretary's Office,
Quebec, 23rd February, 1853.

Sir,—I am commanded by the Governor General to acknowledge the receipt of the Memorial of certain of the members of the Canadian Institute, praying that steps might be taken to ensure the continuance by the Provincial authorities of the Observatory, heretofore conducted at the expense of the Imperial Government, after the proposed withdrawal from Toronto of the Military Detachment connected with that establishment.

I am directed by His Excellency to acquaint you, and through you the Canadian Institute, that the subject referred to in their Memorial has for some time past engaged His Excellency's most anxious consideration, and that His Excellency has already taken the necessary measures to prevent, if possible, the proposed dismantling of the Observatory by the Imperial authorities at the end of next month.

Should the measures above indicated be, as His Excellency trusts, successful, it will then become necessary to consider upon what basis, and for what objects, &c., it is desirable to carry on the Observatory as a Provincial establishment.

The remarks upon these heads contained in the Memorial of the Institute will not fail to receive the attention they deserve when this branch of the question shall require to be considered.

I have the honour to be, Sir,
Your obedient servant,
A. N. MORIN,
Secretary.

Captain Lefroy, R.A., F.R.S.,
President of the Canadian Institute.

Letters Patent of Invention,

Issued from the Bureau of Agriculture, up to the 18th of February, 1853.

George Stacy, of Montreal, for an "Improved Spike Machine." (Dated, 20th January, 1853.)

William Allchen, of the Village of Paris, for an "Improved Scythe Holder." (Dated, 26th January, 1853.)

George Ansley, of the Village of Vienna, for "The Centrifugal and Centripetal Churn." (Dated, 8th February, 1853.)

Ezekiel Burley, of the Township of Clarke, for an "Improvement on the Wooden Plough." (Dated, 14th February, 1853.)

CANADIAN INSTITUTE ESTABLISHED 1849

INCORPORATED BY ROYAL CHARTER.

Canadian Institute.

Tenth Ordinary Meeting, 19th February.

The Council announced the reception of a letter from the Secretary of the Court of Directors of the Hon. East India Company, informing the Institute that it having been represented to the Court by Capt. J. H. Lefroy, R. A., President of the Canadian Institute, that the possession of certain Meteorological and Magnetical Observations made in India, would be of value in this Colony, seven volumes of Magnetical and Meteorological Observations, taken at Madras, Bombay, Singapore and Dodabetta, have been forwarded to the Institute.

The following gentlemen, having been duly proposed and ballotted for at the last meeting, were elected members of the Institute:—

G. H. Sootheran.........................Toronto.
Andrew Drummond.........................„
J. T. Brondgeest.........................„
James Wright, Junior Member...............„
Hon. Peter McGill.........................Montreal.
George D. Gibb, M. D.......................„

A paper on the "Valley of the Nottawasaga," was read by Mr. Fleming, C. E.

Eleventh Ordinary Meeting, 26th February.

The following gentlemen were duly elected members of the Institute:

C. E. Hancock.........................Toronto.
F. F. Carruthers.........................„
Henry Fowler.........................„
William Pyper.........................„

Announcement was then made of the following donations to the Institute:

The Tower Menagerie, with numerous wood cuts and illustrations, after Harvey.

The Sylvia Britannica; or Portraits of Forest Trees.

Map of the Hemispheres—Physical Map of France, Paris, and detached parts of France and Canada—By A. H. Armour.

Two volumes of British Colonial Magnetical and Meteorological Observations. Vol. 1.—St. Helena. Vol. 2.—Van Dieman's Land.—By Capt. J. H. Lefroy, R. A.

Mr. G. W. Allan read a paper "On the Birds wintering in the neighbourhood of Toronto."

Twelfth Ordinary Meeting, 5th March.

A letter was read from F. Cumberland, Esq., accompanied by a donation of eight-and-twenty volumes of Reports of Committees of the House of Commons; also a letter from the Provincial Secretary, in reply to the Memorial of the Canadian Institute, on the continuation under Provincial management of the Magnetical Observatory at Toronto.

The Rev. J. McCaul, LL. D., President of the University of Toronto, read a paper on "The Genuineness of some of the Classical Authors."

Thirteenth Ordinary Meeting, 12th March.

The undermentioned gentlemen being candidates for admission as members, were ballotted for and duly elected:

The Hon. and Right Rev. the Lord Bishop of Toronto.
J. G. Hodgins.........................Toronto.
Henry O. H. George.........................Whitchurch.
S. E. Campbell.........................St. Hilaire.
O. Mowat.........................Toronto.
A. K. Boomer.........................„

Dr. Bovell delivered a discourse on "The Forces which move the Circulation," illustrated by microscopical exhibitions of the circulation of the blood in the web of the frog's foot.

Fourteenth Ordinary Meeting, 19th March.

The following gentlemen were proposed as members of the Institute:—

R. P. Lelande.........................Toronto.
W. Kingston Fisher.........................Artemesia.
— McMicken.........................Toronto.
J. Mitchell.........................„
Angus Morrison.........................„

A donation from Capt. Lefroy, R. A., was announced, consisting of—

Eight volumes of Papers on subjects connected with the duties of the Corps of Royal Engineers;

Brande's Manual of Chemistry, two volumes;

Synopsis of the United States Exploring Expedition;

The following gentlemen were duly elected members of the Institute:—

James Small, M. A. ....Toronto.
E. A. Walker.........................Barrie.
J. H. Esten, } Junior Members.........................Toronto.
Hugh Torney, }

Professor Buckland read a Paper on Ornamental Planting.

It was announced by the President that the Annual Conversazione would take place in the Hall of the Legislative Assembly, on Saturday, April 2nd, instead of Saturday, March 26th, as heretofore proposed.

The Earthquake Shock of 13th March, 1853.

Earthquake shocks, although not unknown in Upper Canada, are of sufficiently rare occurence to show an unusual range, or an unusual direction, in the movement of the earth's crust which occasionsthem, when they are perceived in this neighbourhood. The recollection is still preserved of a pretty strong shock that was felt at Niagara in 1801 or 1802*, and it is the first conclusion of Robert Mallet, from his elaborate examination into the facts of Earthquake phenomena, (Reports British Assoc., 1850,) that "Earthquakes occur over all parts of the earth's surface, both on land, and under the water;" he even goes further, and affirms that there is, at present, no sufficient ground for asserting that one region of the globe is permanently subject to them more than another. The great Lisbon Earthquake of November, 1755, furnishes however the only example which we find in his list, of a shock reported from the lake districsof Canada. They are more common in Lower Canada. Many of our readers will remember a shock which occasioned considerable alarm, and even some damage to buildings, at Nicolet, and on the shores of Lake St. Peter, on the 18th January, 1843, There was another at Montreal and its vicinity in April, 1843. Shocks were observed at Rochester, N. Y., September 19, and October 22, 1844. (R. R.) On November 2, 1850, a little before midnight, a shock, accompanied by a rumbling noise, was perceived at Frederickton, N. B. These instances, which are not given as a complete list, shew that we are less removed from the region of this phenomenon than is commonly supposed by

* Authority—The Hon. Wm. Allan.

Canadians. The shock of the 13th March, which has been generally noticed by the press as felt in the Niagara District, was also perceived at Toronto. "About half-past 5 o'clock, A. M.," writes one observer, "I was startled by a strange rumbling noise: it produced the usual effects of thunder that is near, namely a trembling of the house and bed, and a shaking of the windows; the first impression made upon me was that it was thunder, but I could not help feeling at the time that there was something strange and unusual in the effect produced, and the second impression was that it closely resembled what I had frequently read of earthquakes." A second observer, residing in a different part of the city, and writing quite independently, uses very similar language, but places the time earlier. "About ten minutes before five o'clock, by my watch, I was awakened out of a sound sleep by a rumbling noise, which I distinctly heard for some seconds after I awoke. Mrs. —— who was awake previous to the shock, not only heard the rumbling, but felt the bed vibrate to and fro."

The barometer was falling a little at the time of this occurrence, but its depression was only —.085 at 2 P. M., and at the next observation it had risen; the thermometer was above the mean, a very marked depression of temperature however followed it, giving the lowest of the month, —0.° 2 Fahr., on the night of the 14th instant. A state of magnetic disturbance, of considerable activity, moderate in respect to the amount of the changes, prevailed throughout the 12th.; but the photographic instruments at the Observatory shewed that no particular change of declination accompanied the movement itself. A westerly movement of 6 sec., occurred from 5h. to 5h. 15m.; but for the previous and the following half hours there was no change worth mentioning. The same same remark applies to the horizontal force.

REVIEWS.

1. *Ship Canal from Albany to New Baltimore. Reports and Estimates by W. J. McAlpine, Chief Engineer, and O. Blanc, J. Colman, and W. Perkins, Resident Engineers. Albany*, 1853.

The title which has been given to the Ship Canal projected in the above Report, is scarcely an index to its purpose. Some of our readers will enquire—"Where is New Baltimore?" and we confess we were somewhat startled in not ourselves being able to remember any city of that name, whose importance seemed to justify so great a work as a Ship Canal. New Baltimore is a town of no very great pretensions, on the west bank of the Hudson River, twelve miles below Albany, and in this distance is comprised the main difficulties embarrassing the navigation of that river between New York and Albany. From the former city to New Baltimore, the depth of water suffices for vessels drawing twenty feet; but above, and from thence to Albany, obstacles exist confining the draught of water to eight feet, as the maximum for vessels trading between that city and Tidewater. Time was when this draught of water would have been thought sufficient—nay, we have seen that it has hitherto accommodated that mighty western trade which has choked the Erie Canal, given birth and sustenance to its railway competitors, built up Buffalo, Rochester and Albany, and made New York what it is; not, indeed, that our enterprising neighbours have been content with the natural facilities afforded them, for the obstructions to the navigation of the upper portion of the river, attracted public attention at an early period after the Revolution, and the State of New York having made the first appropriation in 1797, continued a system of improvements in jetties, wing-dams, &c., until 1818, when the public expenditure had reached to very nearly 160,000 dollars.

Up to this period, the improvement of the river seems to have been confided to certain Commissioners, who had considered three systems: 1st. By the erection of piers or dams; 2nd. by projecting dikes or jetties, as adopted by Colborne on the Clyde; and 3rd, by the construction of an independent canal. Of these, the second proposition was adopted, and is said not only to have signally failed in deepening the river, but to have exercised a baneful influence in the formation of many of the recent obstructions to the navigation.

In 1819, a new Commission accordingly was appointed, and under its auspices the first hydrographic survey of the river was made during that year.

This resulted in a renewal of the canal proposition which, although at the time well received, was not adopted, and the whole matter rested till the Spring of 1831. In the interim, the jurisdiction of the Hudson had passed from the hands of the State to the Federal Government, and in 1832 a second hydrographical survey was made, resulting in further reports and suggestions for improvements. At last, and in 1834, Congress made another appropriation, but before its expenditure the whole subject was again referred to a "Board of Engineers," especially instructed to review two projects—one a canal, and the other for deepening the bed of the river—and, of these, the Board recommended the adoption of the latter.

Upon this, Congress voted further appropriations—namely, in 1836. $100,000; in 1837, $100,000; in 1838, $100,000; but in the latter year all further operations were suspended, and no additional appropriation has since been made.

But the tides of trade, like those of the waters, wait for no man. Since the year of the last appropriation, and that on which the improving operations were suspended, although acknowledged to be incomplete, the tonnage to and from Tide Water by the Erie and Champlain Canals *has increased* 1,983,066 tons, being now 2,766,349 tons.

This has hitherto been carried on the Hudson by vessels ranging (with the exception of steamboats) from 30 to 340 tons burthen, drawing from four to a maximum of eight feet nine inches. Of all the vessels enrolled at the Custom House at Albany in 1852, the "E. Corning," a barge, was the largest; having length, 144½ ft.; breadth, 29½ ft; depth, 8¾ ft.; and tonnage, 344.50.

It appears that the average cost of a trip from Albany to New York and return, is, for a canal boat of 90 tons, $90, and for a barge of 200 tons, $128; that the trade averages "three tons down to one up" freight, shewing a cost of movement of 75 cents per ton in a 90 ton boat, and 48 cents per ton in a 200 ton barge. Taking this as the basis, it is estimated that if the depth of the water allowed the passage of vessels of 1000 tons, the cost for movement in a 500 ton vessel would be reduced to 30 cents per ton, and in 1000 ton vessels to 18¾ cents per ton.

Again, in consequence of insufficient depth of water in the river, vessels now employed on it seldom go beyond the City of New York, and the trade even between Albany and Boston, Providence, Baltimore, &c., is subject to transhipment at that city, which, under the most favourable circumstances, costs 20 cents, or, if taken into store and then reshipped, one dollar per ton. This transhipment of flour results in a depreciation to from 1½ to 2 per cent., and wheat and other grain are also subject to considerable waste.

All these objections are urged as sufficient justification for the construction of a Ship Canal of 12½ miles in length, and capable of passing vessels drawing from 15 to 20 feet of water.

The dimensions of the proposed Canal are as follows:—Width at bottom, 50 feet; at water line, 120 feet; and 20 feet depth of water.

At Albany the Canal Basin will communicate with the river by two ocks combined, each 10 feet lift, 215 feet long, and 30 feet wide; and

at New Baltimore by two locks combined, each 10 feet lift, 300 feet long, and 50 feet wide.

With reference to the expenditure of water, the loss by evaporation is assumed at $\frac{1}{4}$ inch per day, (it is said to range during the dry season from $\frac{1}{5}$ to $\frac{1}{3}$ of an inch per day) which, over a length of $12\frac{1}{2}$ miles of 120 feet wide, would give a loss of 240 cubic feet per minute.

The estimate for the loss by filtration, has been based on that of the old Erie Canal, (24 feet wide at bottom, 4 feet depth of water, and side slopes, each 8.944 feet long,) which, after investigation, is assumed at 50 cubic feet per mile per minute, giving for the Ship Canal a loss of 5,087 cubic feet per minute for the $12\frac{1}{2}$ miles.

For the lockage, 10,000 tons per day is the freight assumed to be passed, requiring 5,887 cubic feet per minute.

These items, together with leakage at waste weirs and locks, give a total consumption of 16,000 cubic feet per minute.

To supply this seems to be the most complicated point of the scheme, and the more especially, because it is proposed to elevate the Ship Canal so that its surface of water will be 20 feet above the surface of the river at extreme low water mark. This will make it necessary (in pumping) to elevate the water on an average of say 18 feet.

This recommendation is made with a view of avoiding the expense of excavating below the level of the water in the river, and to the protection of the works against the influence of freshets, so destructive to property in the locality.

It seems that in some freshets the rise of water in the river in front of Albany has been as much as 18 feet above low water mark; and it is contended that if the river levels were adopted, the banks would be subject to overflow, the canal be liable to filling up, and endless expense result in keeping the bottom dredged out. In consequence of this periodical rising of the waters, many important branches of manufactures for which the position of Albany would afford great inducements, cannot now be advantageously established there; for no business, subjected to active competition, will bear either land carriage to any point in the vicinity above these influences, or the elevation of the factories, and the consequent expense of lifting and lowering the raw material and manufactured article through the necessary space.

It is argued therefore that in addition to the other advantages, the high water level of the Canal Basin will yield an opportunity for the pursuit of many manufactures before prohibited.

Two modes of water supply are suggested,—one of elevating the water from the river by steam power, the other by building reservoirs on streams in proximity with the Canal, and thus saving during floods and the suspension of navigation, a sufficient amount of water for service during navigation.

The natural flow of the streams during the dry season is estimated at 2,000 cubic feet per minute, leaving 14,000 cubic feet per minute to be provided for two months,—12,000 during two months,—and 5,000 during two months,—the difference being due to the increased yield of the rivers during those periods of the season.

The estimated annual cost of this supply (including interest on cost of Engines and Pumps—$90,000) is $12,600.

The second plan would involve the construction of six reservoirs on the Normanskill river, the estimate for which is $428,000; and the annual expense of working (inclusive of interest) $35,967, shewing an excess of the cost of steam of $6,633 over reservoir supply. The Engineers have prudently refrained from recommending either system as superior,satisfying themselves by the adoption of the highest estimate.

The total cost of the Canal, including supply of water, land damages, and Engineering, is estimated at $2,450,000, which at 7 per cent. and adding annual current expenses of working and repairs, would represent an annual cost of $246,500, or the amount which should be derived from the Canal to make the investment remunerative.

The estimate of revenue is based—1st. on the rental or sale of the land (we fear a very questionable source) to the amount of $12,000 per annum, leaving $134,000 to be derived from tolls. The present rate of tolls on the New York State Canals is four mills per 1000 pounds per mile: this on the ship canal would amount to 10 4-10ths cents per ton. Assuming 10 cents per ton as the toll to be levied, an annual aggregate trade of 1,345,000 tons would be necessary to make the investment pay as above. *This is less than half the tonnage of last year moving between the Erie and Champlain Canals and tide water* and as the continual growth of the trade may seem to be relied on, instead of $2\frac{3}{4}$ millions of tons as in 1852, the progressive increase would yield in 1856 4 millions, and in 1860, 6 millions of tons.

Relying on the advantages of making Albany the shipping port, whereby the cost of carriage (as in small bottoms) would be reduced, and that of transhipment with its depreciating results avoided,—and arguing that in consequence of their form ocean sailing vessels may be towed at a cheaper rate (proportionably to their tonnage) than canal boats, the projectors of this Canal depend, fairly enough, upon securing the larger share of the trade.

We are not inclined to an adverse judgment upon a scheme so enterprising, propounded in a report so skillfully and judiciously drawn as is this—but the course of trade does not always yield to the Engineer, charm he never so wisely—there are other influences beyond his controul (as the combination of established interests and capital) which may offer insuperable difficulties to the diversion of so large an item in ocean traffic and the profits connected with the carrying trade, as that for which Albany would now compete with New York.

It may be said. with much plausibility and some truth, that with this canal ocean vessels may freight as well at Albany as at the mouth of the river, but is there no risk of loss of time and demurrage?

A vessel entering inwards at New York, brings a general cargo to be distributed through the length and breadth of the Union,—unloads, ships her outward freight, and is off again.

Run her up to Albany to ship her outward freight,—and if thereby she loses one trip in the year, she forfeits more than the profits made out of the river transit. We write diffidently, for we are not entirely at home on matters strictly commercial; yet what is it that justifies the authors of this Report in saying that "the Hudson is the natural channel of the trade of Canada West," but that they mistake the course of trade for the path of nature? It is certainly no want of facile communication with the ocean which forces the trade of Canada West to the Hudson and New York, but precisely those attractive influences of capital and combination which, as they overcome in a great degree the advantages of our noble St. Lawrence and scarcely less noble canals, may hereafter offer an obstacle to the use of that at Albany, implying as it does the withdrawal of a profitable trade from New York.

We deny that the Hudson is the natural outlet for our trade; and as large sums of money have been expended in the improvement of the St. Lawrence, we may be pardoned for hoping that it may soon cease to be the artificial one; and that when Albany shall have intercepted New York for the ocean freights from the westward, our canals shall have claimed their own in the same service. Happily there promises to be enough for us all; and, therefore, eschewing any sectional jealousies, but without making any effort at generosity, we wish this scheme, so ably propounded, the highest success which its promoters anticipate. One matter, however, in connection with its construction, would seem to demand comment before we close. We perceive that the lockage is confined to two locks at the north and south ends, all of equal lifts, namely, 10 feet. We are not aware of the fall of the Hudson River between Albany and New Baltimore, but its velocity would lead us to conjecture that it must be considerable, and that provision must necessarily be made for it. It is apparent that unless the river line at both places be coincident, or the fall of the canal be made equal to the fall of the river, (neither of which is probable) the lift of the locks at New Baltimore should be greater than those at Albany, or intermediae lockage be inserted.

Ontario, Simcoe and Huron Railroad.—Report by the Chief Engineer. Hugh Scobie, Toronto, 1853.

This is a straight-forward, business-like document, much more to our fancy than the grandiloquent effusions it is sometimes our misfortune to see issued in connection with engineering projects. We think Mr. Cumberland has exercised a wise discretion in giving so simple a statement of facts, and so plain an exposition of his views in connection with the enterprize with which he is charged; for, undoubtedly, it was originated by persons not honoured with a very large share of public confidence; and that which, on the part of some, was at first a justifiable suspicion, seemed ultimately to strengthen into a blind prejudice and opposition, outliving the causes which induced them. Such a Report, therefore, as that before us, (even apart from its strictly engineering, statistical and commercial features) is well timed, for it puts the public in possession of the present condition and management of the work, and satisfactorily proves that if its earlier controul and government were inefficient, the main objections have been removed, and an independent and vigilant supervision secured for the future.

In connection with these points, we observe that under the instructions of the Railway Commissioners, Mr. Cumberland, in conjunction with Mr. Keefer, recommended "some alterations, tending principally to the reduction of curvature, and the more substantial and permanent character of the structures;" that on his assuming the charge of the works, and prior to the granting of Government aid, the original contract was set aside and a new agreement entered into between the Company and the Contractors, whereby "the entire completion of every anticipated requirement, including harbours, depôt service, and full equipment of rolling stock, has been secured on equitable terms,"—and, further, that under that agreement "the whole of the Engineering Staff, previously in the service of the Contractors, has been re-organized and transferred to the service of the Company, and placed under the direct authority and controul of the Chief Engineer. All contracts will hereafter be made by the Company's Officers, as well for depôt, rail and harbour service, as for locomotive power and general rolling stock; and the whole authority of construction and management be centred in and exercised by the Direction and its responsible officers, the Chief Engineer being farther amenable to the Railway Commissioners for the fulfilment of their regulations." The works are therefore now being carried on under the same system as obtains on others of similar character, and there is no longer any reason for doubting that they will be creditably prosecuted to completion.

With reference to the progress and opening of the line, we see that 31 miles of rail have been laid, and that 44 miles are on hand ready to lay early in the Spring;—that the Road will be opened to Newmarket in May, to Bradford in June, and to Barrie in July next; and that the whole length to Lake Huron is expected to be ready for traffic in September next.

With regard to the location of the line from Barrie to Lake Huron, Mr. Cumberland (prompted probably by a desire to satisfy, if that be possible, the different interests competing for it,) appears to have made a very complete examination of the country, having run no less than five lines of exploration between Lakes Simcoe and Huron, the results of which he details very fully in his Report. We doubt, however, if his perseverance, and the liberality of the Directors in authorizing such unusually extensive surveys, will be appreciated by any but the shareholders and those connected with the adopted line; for, although to an unprejudiced judgment he seems to justify his decisions, he will scarcely escape the sectional opposition always resulting from disappointment.

The recommendation made to carry the line westward to Sydenham and Saugeen, is highly judicious, for undoubtedly with 94 miles already made, this Company by a short extension, can serve the whole of the Owen Sound Tract as efficiently, much sooner, and more profitably than it could be served by any other means; and the more especially, as that Tract can scarcely be said to be yet so advanced or thickly settled as to justify any independent scheme, or offer for years to come a remunerative field for a special line. We are, therefore glad to hear, from other sources, that Mr. Cumberland has been instructed to carry his proposal into immediate execution.

Whilst referring to the Northern Terminus of the Road, to which so large a proportion of the Report is devoted, we cannot refrain from expressing our surprise that so little should have been said as to the Toronto Depôts, concerning which so much excitement at present prevails. On this point Mr. Cumberland writes with great caution,—indeed, we may say, with a studied mystery or affected indecision. But why assume that to be secret which is known to everybody? Why play the diplomat when there is nothing to withhold? Is it that mistaking the opposition of the Corporation for the feeling of the citizens, he permits himself to be frighted from his propriety; or does he pay the commercial men of the City of Toronto so poor a compliment as to believe that they desire to see their water frontage for ever lying waste and unproductive, as it is and has been. For our parts, we have known long before his Report was published, that the vacant grounds at the Queen's Wharf, and between Yonge and Bay Streets, were to be appropriated by the Northern Company; and, undoubtedly, if the interests of the City as well as of the Railroad are to be consulted, those are the positions best adapted to the purpose. In our opinion it would have become the Chief Engineer better to have spoken out boldly, for although *he* may entertain a very natural dread of awakening a body which is said to be harmless only when it is asleep, the selection is so judicious as to command a general support far too powerful to be overruled by any adverse corporate decision.

Appended to the Report are some interesting statistical tables, and two excellent maps—one of Canada, and the other of the Counties of York and Simcoe. Indeed, the whole document seems to have been prepared with great care and completeness, and is well worthy of attentive perusal, especially by those who desire to have an insight into the prospective trade and traffic between the seaboard and the far west, which this line is intended to accommodate, and which marks it therefore as a road peculiarly valuable to Toronto and worthy of its support.

"Seventh Report of the Board of Works (of Toronto) for 1853."

This Report, as published in the Toronto newspapers, occupies exactly twenty-seven lines, (including the date and Chairman's signature,) and recommends an expenditure of £27,108 2s. 0d.; being at the rate of about £1,004 per line! The coincidence is as strange as the standard of critical admeasurement is novel; but the brevity of the explanatory and the fullness of the financial portions of the document contrast so harshly, that we felt bound to search for something in common—some connecting link between them—and have to thank the printer's devil for supplying, with sly drollery, that which the authors had certainly evaded or forgotten.

Although this Report is suggestive of very grave considerations in connection with general corporate administration, we shall, in any observations we may make upon it, confine ourselves strictly within the limit consistent with the specific purposes of this Journal, which certainly extends to all works of public improvement, and especially comprises whatever is connected with the application of sanitary measures.

On an examination of the Estimates of the Board of Works, (which at a glance it is evident have neither been prepared or recommended under professional advice,) we perceive that an expenditure is contemplated during the current year of no less a sum than £17,644 15s. 0d., on the item of sewerage alone! We naturally enquire—"Upon what principle is this large expenditure to be made"?—"has *any* system of sewage been adopted applicable to the whole City, and capable of extension with its growth?—and, if so, is it such a system as is warranted by the experience of the past, and justified by the results of recent scientific and legislative investigation?" We are bound to say that there is evidence in this Report that it is not, and

that the system therein propounded stands self-condemned. A total length of 12,138 yards of sewers is included in the estimate, divided into three classes in the following proportions :—1st. 500 yards valued at 50s. 0d ; 2nd. 3,168 yards at 27s. 6d.; and 3rd. 8,470 yards at 22s. 6d. Now, of the third class, (of course the smallest in area,) some is to be inserted in immediate proximity to the Bay, and some as far north as Gerrard Street—in both positions, on lines north and south ;—whilst of the second class, some again will be in direct communication with the Bay, and some on Church Street as far north as Carlton Street—in both localities again directing north and south ! Both these classes of sewers (and in them is comprised the whole system, for the 1st class is in connection with a creek, and therefore, a special provision) are further indicated as running east and west as well as north and south ; so that no matter in what section of the City, whether near the Queen's Wharf or the Windmill, Front Street or the Concession Line, at a high level or a low, far or near the outlet, sewers will be found having the same sectional area, the same depth and the same direction, if the estimate of cost be any index to their capacity and depth. The alternative is unsatisfactory, for either the system or the estimate is radically wrong—the system, if but two classes of sewers are contemplated—the estimate, if more than two are to be provided ; nay, *the latter in any event* for depth, is of the essence of the cost, and it must vary with the position. Is it to be credited by any one professing to common thought and observation, that two classes of Sewers will suffice for the drainage of this City in an efficient and economical manner? Is it not apparent at a glance that if only two are adopted (and especially varying so slightly in cost and area) some will be unnecessarily large and extensive, whilst others will be too small to perform their allotted duty? Experience has proved that a drain of an excessive area is almost as damaging in its results as one of deficient capacity, and certainly either in one or other respect error must be constantly repeated when the resources are within such narrow limit. The Reports of various Commissioners (as "the Health of Towns," "the Metropolitan Sanatory," and "the Supply of Water,") are clear and unanimous upon this point, and yet notwithstanding their teaching *we* continue to pursue all the errors which they condemn, and to disregard all the amendments they suggest, as though the people of Great Britain, to whom these Commissioners addressed themselves, claimed a patent right to the results of their investigations.

Another item in this Report, namely, that of "Culverts," demands comment. It occurs twenty-eight times, representing 282 Culverts, all entered at £6. Now, if by the term "Culverts," it is intended to describe vertical shafts or conductors for the surface drainage, their cost must vary with their depth, which is dependent on the depth of the sewers to which they are to be attached, and the estimates must accordingly be erroneous. But the details of cost are not of so much importance as the principles of construction, and we refer to them here only to show that custom is no security for economy. In the matter of vertical drains for instance, the old—and we wish we could say the exploded—system of the open shaft with its unchecked and offensive vapours arising from the sewer beneath, and bearing with them miasma and disease, might be *economically* superseded by a trapped conductor, even if the more modern system of independent surface drainage should be thought too extravagant a luxury.

But again, in the item of Bridges, we find eleven stone Bridges, conveniently estimated at £120 each, although eleven different localities are named for them ! Are they all to be of the same height, depth, width, span and thickness? Are our street levels so very regular, is our soil so universally stable, are our streams so nicely balanced in content and velocity—that one style and manner of construction will meet every contingency? Or is it that we are satisfied to stick a "regulation pattern" at a "regulation price" anywhere and everywhere—fit or unfit, costly or economical in relation to the duty to be fulfilled? We fear the latter is the system, for on no other would an equality of estimate be justified, as on no other could the peculiarities of some of the structures be explained,—as for instance those of the Church Street Bridge, where the crown of the arch is some feet above the gradient of the road, and the drain holes ingeniously inserted in the crown of the arch !

But our limits will not permit us to enlarge. There are other points demanding comment to which we may hereafter return,—as the macadamising and planking of our streets and side walks, the water supply, and other branches of public expenditure involving the cleanliness, health and comfort of our city. For the present we must content ourselves by the mere expression of our belief that the Report of the Board of Works, recommending so large an outlay in so loose and slovenly a manner, and indicating such utter inefficiency of system, will not be acceptable to those in whose service it is made.

SCIENTIFIC INTELLIGENCE.

An Entomological Curiosity.

In the interesting lectures on Entomology, recently delivered in this City by Dr. Goadby, which have attracted so much attention, the learned lecturer on one occasion alluded to that pestilent insect mentioned by the celebrated traveller, Bruce, whose statements have very frequently been called in question, and he much maligned, but which have generally been found subsequently to be perfectly veracious. He mentions an insect called the Zim, at whose approach the inhabitants of whole districts take to flight, and retreat to far distant regions, where the pest has not yet arrived. The description is so extraordinary that many persons are inclined to doubt the truth of it. The following extract from the proceedings of the Entomological Society, of February 7th, will show that South Africa rejoices in an insect fully equal to the Zim :—

"Dr. Quain communicated through Mr. Spence, an account from William Oswell, Esq., of a fly (*Glossinia Morsitans*,) called "Tsetse" by the natives, (and resembling the Zim of Bruce,) in South Africa, the bite of which was fatal to all domestic animals, except the goat, but innoxious to man and the wild animals. On one occasion the writer lost forty-seven out of fifty-seven head of cattle, the bite of three or four being sufficient to cause the death of an ox ; the poor animals swelling at the eyes and throat, gradually wasting away, refusing food, and dying in from twelve to fourteen days."

On the Causes which render Bread Stale.—It has been generally considered that fresh bread loses water when passing into the stale state, and that this is the sole cause of the metamorphosis. Boussingault shows that this change is effected even when the bread is kept in a damp cellar, the hardest and most brittle crust becoming tough and flexible.

A loaf kept in a warm, dry room for six days, at the end of which time it was perfectly stale, had lost only 0.01 per cent, from which it is quite clear that the staleness could not have arisen from a loss of water. By heating it for some time, up to 158° Fahrenheit, it became quite fresh, having lost $3\frac{1}{4}$ per cent. of water.

Various other experiments were instituted which showed the same result ; in a tin plate cylinder closed with a stopper, the author completely restored stale bread to the fresh state in the course of an hour, by a temperature of 122°—140° Fahrenheit, produced by a water bath.

The staleness of bread results, therefore, from a change in its molecular condition, altered by the application of heat, and not from a loss of water.—*Comptes Rendus, p.* 588.

Tellurium.—It is said that this metal has lately been obtained in large quantities during the working of the gold ores of Transylvania, and, although hitherto so rare, will shortly be brought into the market by the pound.

Remedy for the Stings of Bees.—M. Gamprecht recommends rubbing the stung place with the freshly-expressed juice of the honey-suckle (*Lonicera Caprifolium*.) The expressed juice may be kept in closely-stoppered bottles for this purpose.

'*On Winiwarter and Gersheim's Patent "Gunprimers," and Composition for Fire-arms,*" *by* Mr. Winiwarter, *of Vienna.*—The various applications included in Gersheim's patent all more or less depend on the nature and properties of their new composition powders ; which, at the same time that they may be employed to replace gunpowder as a propelling power, may also be used instead of fulminating powder, as a means of inflaming or firing. These patent explosive compositions consist of various well known explosive substances : namely chlorate of potash, fulminating mercury, fulminating zinc, amorphous phosphorus, and binoxide of lead. But to each of these different mixtures, a solution of gun-cotton or collodion is added as a cement ; and the application of this substance is the chief peculiarity of the invention.

Monthly Meteorological Register, at St. Martin, Isle Jesus, Canada East, February, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—Estimated Height about 30 ft.

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Mean Velocity in Miles per Hour.			Rain in Inch.	Snow in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P.M.	10 P.M.	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P.M.			6 A. M.	2 P. M.	10 P. M.	
1	30.089	30.016	29.887	—12	12.5	4	.028	.071	.058	1.00	.82	1.00	N E b E	N E b E	N E b E	Calm.	2.20	3.90			Clear.	Clear.	Clear.	Auro.Bor. Zod.Light.
2	29.9·4	29.750	.592	9	42	39	.071	.243	.255	1.00	.85	1.00	N N E	S W	S	0.74	2.14	10.14			Lgt. Cirr.	P'gt cirr 4	Rain 8P.M	
3	.767	.846	.942	37	38	27	.238	.236	.156	1.00	.95	.94	S W	S W	N W	14.75	8,04	8.12	Inap.		Str. 10.	C.C. St 3	Clear.	
4	.820	.862	.897	30	39	37	.186	.240	.238	1.00	.97	1.00	E	S	W S W	3.12	5.30	5.02	0.10		Str. 10.	Rn.,8a.m.	Str. 10.	
5	.932	.800	.712	34	36	32	.214	.239	.199	1.00	.100	1.00	N E b E	N E b E	N E b E	Calm.	4.12	5.24	0.42		Fog.	Rain.	Rain.	
6	.718	.990	.994	30.5	34	17	.186	.195	.116	.98	.91	1.00	N N E	W	W	8.00	Calm.	Calm.		1.00	Sleet.	Snow.	Clear.	
7	.998	.893	.815	4	23	18	.058	.106	.120	1.00	.73	1.00	N b W	N b W	W N W	Calm	1.16	Calm.			CumSt.4.	CumStr6	Clear.	
8	.886	.864	.812	3	31.5	10	.055	.135	.089	1.00	.69	1.00	W N W	W N W	S W	Calm.	Calm.	Calm.			Clear.	Clear.	Clear.	Aurora Bor. at 4 a.m.
9	.733	.831	.841	18	20	— 1	.120	.078	.045	1.00	.63	1.00	W N W	W N W	N W	Calm.	17.24	6.81			Clear.	Clear.	Clear.	Zod.Light,very brigt
10	.681	.460	.418	— 7	27	24	.035	.118	.128	1.00	.70	.95	E N E	S S E	S S E	0.57	5.84	6.24		0.65	Clear.	Str. 10.	Snow.	
11	.312	.296	.298	21	43	30	.150	.272	.186	1.00	.92	1.00	S b W	S b W	W N W	21.20	12.21	9.50		1.65	Str. 10.	CumStr9	CumStr.9	
12	.800	.924	.931	—1.5	20	— 1	.051	.103	.038	1.00	.87	.83	N W	N W	S b E	18.02	1.12	1.64			Clear.	Clear.	Clear.	
13	.809	.437	.337	— 7	8	10.5	.035	.058	.075	1.00	.80	1.00	N E	N E	N b W	5.62	8.29	7.17		6.70	Str 10.	Snow.	Snow.	
14	.475	.924	.760	5	15	0	.049	.081	.048	.78	.84	1.00	N N W	N W	W b N	12.07	15.41	11.65			do.	CumStr.8	Clear.	Aur.Bor.till daylight
15	30.031	.900	.827	—18	19	9.5	.020	.087	.071	1.00	.75	1.00	N E	E S E	N E	1.75	0.89	3.81		1.20	Clear.	Snow.	Str. 10.	
16	29.765	.493	.298	10	22	21	.073	.120	.130	1.00	.94	1.00	N E b E	N E b E	N N W	9.26	5.00	5.62		7.60	Str. 10.	Snow.	Str. 10.	
17	.565	.696	.831	20	22.5	8	.110	.113	.058	.95	.86	.80	N N W	NW b W	N N W	13.91	25 53	16.86			CumStr.9	CumStr4	Cirr. 4.	
18	.878	.747	.717	—12	21	— 3	.026	.087	.043	.93	.62	1.00	N E	S S W	W b S	7.47	1.19	2.50			Clear.	Clear.	Lgt. Cirr.	Lunar Halo at 9 p.m.
19	.730	.521	.479	—13	29.5	— 3	.025	.031	.043	.93	.76	1.00	W	S S W	S W	Calm.	Calm.	0.12			Clear.	Clear.	Clear.	
20	.373	.279	.386	— 5	20.5	— 1	.036	.130	.013	.96	.70	.90	W	S W	NW b W	0.50	2.62	0.94			L'gt cir.	Clear.	Clear.	Aurora Borealis.
21	.527	.537	.609	— 2	33.	16	.043	.170	.112	.96	.79	1.00	W b S	W S W	S W	5.10	5.55	3.81			Clear.	Clear.	Clear.	Lunar Halo.
22	.469	.369	.386	21.5	25	32	.123	.124	.199	.94	.79	1.00	S S E	N E b E	N b E	3.00	2.90	0.18		3.30	Str. 10	Snow.	sli'gtrain	
23	.284	28.993	28.938	30	34	25	.180	.195	.155	.98	.91	1.00	N E b E	N N E	N W	2.29	14.44	16.25		15.71	Snow.	Snow.	Snow.	
24	.239	29.309	29.464	69.5	28	9	.030	.123	.037	.94	.68	.93	W S W	W	W N W	20.45	15.90	12.37			CumStr.4	CumStr4	Clear.	
25	.551	.514	.642	5	25.3	14	.018	.120	.083	.95	.88	.93	W N W	W N W	N	6.30	11.41	10.90			Clear.	C.C.Str.8.	CumStr 4	Zod.light elonga. 47°
26	.747	.731	.789	— 5	31	10	.038	.130	.062	1.00	.60	.80	W	W	W	5.27	4.00	3.97			Clear.	Cirr. 2.	Clear.	Do. do.
27	.945	.931	.950	—65	29	7	.000	.120	.065	.83	.58	1.00	N E	N E	N E	0.06	0.72	0.70			Str. 4.	Clear.	Clear.	Do. do.
28	.830	.635	.532	10	27.5	21	.069	.131	.116	.91	.80	1.00	N E b E	N E b E	N E b E	7.50	9.00	18.28		13.25	Str. 10.	Snow.	Snow.	

Barometer.	Highest, the 1st day	30.089
	Lowest, the 23rd day	28.938
	Monthly Mean	—.654
	" Range	1.151
Thermometer	Highest, the 11th day	43.0
	Lowest, the 15th day	—18.0
	Monthly Mean	16.36
	" Range	61.0

Mean of Humidity—.906.

Greatest Intensity of the Sun's Rays—69.0.

Most Prevalent wind—N. E. by E.

Least do. do. E.

Most Windy Day—the 24th day.

Mean Miles per Hour—19.59.

Least Windy Day—the 8th day.

Mean Miles per Hour—inapp.

Snow fell on 9 days, amounting to 51.06 inches.

Rain fell on 3 days, amounting to 0.52 inches.

Aurora Borealis visible at observation hours, on 4 nights.

Lunar Halo, on 2 nights.

Zodical Light on the 25th—Elongation, 47°.

The Electrical state of the Atmosphere, has been marked *generally* by feeble intensity of a *Positive* character, and on the 13th, 15th, and 26th days, indicated, for several hours each day, a high Tension of *Positive* Electricity; and from 9 a. m. to 2 p. m., on the 22nd day, about an equal Intensity of Negative Electricity.

ERRATA IN REPORT FOR JANUARY.—For "Aurora Borealis visible at Observation Horizon—2nd night;" read—Aurora Borealis visible at Observation hours, on 2 nights.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—February, 1853.

Latitude 43 *deg.* 39.4 *min. North. Longitude,* 79 *deg.* 21 *min. West. Elevation above Lake Ontario :* 108 *feet.*

Magnet	Day.	Barom. at tem. of 32 deg.				Temperature of the air.				Tension of Vapour.				Humidity of Air.				Wind.			Rain in Inch.	S'nw in Inch.
		6 A. M.	2 P. M.	10 P. M.	MEAN	6 A. M.	2 P. M.	10 P. M.	M'N.	6 A. M.	2 P. M.	10 P. M.	M'N	6 A. M.	2 P. M.	10 P. M.	M'N	6 A. M.	2 P. M.	10 P. M.		
						°	°															
c	1	29.803	29 696	29.656	29. 715	30 2	33 4	30.5	31 33	0.147	0.171	0.155	0.159	88	90	91	91	E S E	E	E b N	- -	- -
b	2	.578	.355	.640	. 536	35 2	40 1	35.9	37 07	.186	.214	.180	.196	91	87	86	87	E	S	W b S	Inap	- -
ac	3	.820	.898	.805	. 839	30 9	35 2	34 1	33 33	.143	.160	.176	.16	82	79	91	85	W	S	E	0.325	- -
c	4	.459	.646	.834	. 666	35 5	43 4	35 2	37 58	.201	.249	.167	.19	97	90	82	84	E	W S W	S W b W	- -	- -
c	5	.874	.821	.658	. 782	35.2	31.5	21.6	28.65	.182	.155	.114	.143	89	90	84	89	S W b W	N	N	- -	6 0
b	6	.741	.937			18.2	22 9			.087	.167			83	53			N N W	N W b N	N N W	- -	- -
b	7	.925	.823	.870	. 873	3 6	20 6	8 6	11.20	.046	.092	.055	.066	82	81	80	82	N b E	N N W	N N W	- -	- -
b	8	.873	.772	.803	. 815	–0 6	29 2	20 6	17 22	.038	.098	.097	.07	83	60	84	75	N	S W b S	N W b W	- -	0 1
a	9	.859	.853	.717	. 804	10 8	13 8	13 2	12 67	.047	.047	.064	.05	88	54	76	72	W b N	W b S	W S W	- -	0.2
c	10	.317	.074	.102	. 160	20.0	27 1	30 9	26 37	.095	.135	.130	.12	84	99	76	82	S S W	S W	S W	- -	0 2
a	11	.102	.137	.486	. 269	33.4	38 8	20 0	29 70	.154	.177	.097	.140	80	75	87	82	S W	S W	N W b W	0.050	0.1
ad	12	.755	.804	.685	. 748	8 8	16.5	11.1	12.72	.058	.071	.059	.06	83	73	78	74	N	N E b N	N N E	- -	0 2
cd	13	.359	.293			19 4	27 1			.096	.121			83	74			E	W	W	- -	0 3
b	14	.654	.727	.849	. 751	15 1	19 0	9 5	14 38	.072	.077	.056	.065	80	71	78	73	N W b W	N N W	W N W	- -	0.5
cd	15	.723	.571	.651	. 650	23.3	34 5	24.3	27 22	.105	.165	.107	.127	82	86	81	83	S	S W b S	S S W	- -	1.6
b	16	.480	.255	.560	. 433	32.3	35 0	26.2	30 62	.168	.193	.129	.15	93	95	88	90	S b W	N E	W b N	- -	1.0
b	17	.810	.832	.797	. 815	18 0	24 1	17.5	19 50	.077	0.08	.095	.087	75	74	94	79	W	W	Calm.	- -	0.2
c	18	.713	.625	.655	. 654	12.9	19 0	7.9	12 15	.063	.055	.047	.053	76	80	69	76	N E b N	E N E	N N W	- -	- -
c	19	.630	.468	.357	. 481	10.4	20 0	15.1	15.13	.060	.091	.073	.076	80	81	80	81	W b N	N N E	N N E	- -	- -
	20	.275	.302			19 0	19 3			.095	.087			90	80			W S W	N W b N	W b S	- -	- -
ce	21	.473	.443	.398	. 430	6 5	27 4	26 9	19.90	.055	.122	.131	.101	87	81	88	86	W	S W b S	S W	- -	1.5
c	22	.189	.197	.286	. 231	32 7	37.7	29 9	32 97	.174	.195	.133	.160	94	87	80	88	S E b S	Calm.	N b W	Inap	0 2
a	23	.210	.185	.351	. 254	22.3	19 0	16.8	18 80	.093	.075	.079	.085	75	69	81	79	N N W	N W b N	N W	- -	- -
b	24	.499	.479	.570	. 522	12 3	25.2	21 9	19 90	.061	.082	088	.077	75	56	73	68	N W b N	N W b W	W S W	- -	0.2
a	25	.594	.582	.631	. 607	21 8	31 6	27.4	25 82	.101	.144	.115	.118	84	80	75	79	W b S	N W b N	N E	- -	- -
b	26	.686	.686	.727	. 704	19.7	35 9	27.3	26.97	.093	.145	.133	.120	84	69	88	80	N b E	S S W	N N E	- -	- -
c	27	.755	.629			24.8	35 7			.127	.189			94	9[illegible]			N E b N	E	E b N	0 510	0 3
c	28	.337	.149	.230	. 235	35 0	36 6	34.8	35.15	.192	.200	.191	.194	95	93	95	95	E b N	E N E	Calm	0.145	- -
	M	29 509	29 545	29.507	29 552	21 07	28 90	22 92	24 05	0 110	0 135	0 111	0 117	85	79	83	82	M's 6.63	M's 8.87	M's 6 67	1 030	12.6

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
2031.65	2215 70	924 32	941.18

Mean velocity of the wind - - 7 29 miles per hour.
Maximum velocity - - - - - 23 9 ml's per h'r, from 8 to 9 p.m. on 5th.
Most windy day - - - - - 23rd : Mean velocity, 16.75 miles per hour.
Least windy day - - - - - 19th : Mean velocity, 3.02. ditto.
Most windy hour - - - - - noon: Mean velocity, 9.13 ditto.
Least windy hour - - - - - midnt: Mean velocity, 5.87 ditto.
Mean diurnal variation - - - 3.26 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 29 937, at 2 P. M., on 6th } Monthly range:
Lowest Barometer - - 29.074, at 2 P.M., on 10th } 0 863 inches.

Highest observed Temp. - 43.4, at 2 P. M., on 4th } Monthly range:
Lowest regist'd Temp. - —1.4, at A.M., on 8th } 44 8
Mean Highest observed Temperature - - 29.75 } Mean daily range:
Mean Registered Minimum - - - - - 15.35 } 14.40
Greatest daily range - - - - -35 4 from 2 P.M. on 11th, to 7A.M. on 12th.
Warmest day - - 4th - - - Mean Temperature - 37 58 } Difference:
Coldest day - - - 7th - - - Mean Temperature - 11.20 } 26.38

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for February.

Ye'r	Temperature.				Rain.		Snow.		Wind. Mean Velocity.
	Mean.	Max.	Min.	Range.	D'ys	Inches.	Dy's	Inch.	
	°	°	— °	°					
1840	28 03	49.1	— 8.3	57.4	8	1.475	6	not regis'd	Miles.
1841	22.61	43 4	— 0 3	43.7	1	inapp.	9		--
1842	27.51	48.7	2 5	46 2	8	3 625	9		--
1843	14 97	37 5	—10 2	47 7	1	0.475	21	14.4	--
1844	27 34	47 1	— 0 4	47 5	4	0 439	7	10.0	--
1845	25.81	46.6	— 3 9	50 5	5	imperfect	9	19.0	--
1846	20.80	41.4	—16 2	57 6	0	0 000	13	46 1	--
1847	22 49	41 2	— 1.0	42 2	2	0.559	13	27.3	--
1848	25 95	46 9	— 0 6	47 5	4	0.775	8	10.8	5 69
1849	20.04	41 1	— 9.2	50 3	2	0 249	13	19 2	6.58
1850	26 38	49 2	4 3	44.9	9	1 225	9	23.1	7 61
1851	28 27	50 2	1 3	48.9	7	2 600	4	2 4	6.94
1852	23 82	41 2	— 3 2	44 4	3	0 650	11	13.0	6 42
1853	24.06	43.4	— 0.6	44.0	4	1.030	15	12.6	7.29
M'n	24.30	44.79	— 3.27	48.06	4.1	1.007	10.5	17.99	6.75

Royal Institution, January 21.

"OBSERVATIONS ON THE MAGNETIC FORCE," BY PROF. FARADAY.

Inasmuch as the general considerations to be brought forward had respect to those great forces of the globe exerted by it, both as a mass and through its particles, namely, Magnetism and Gravitation, the attention was first recalled briefly to certain relations and differences of the two which had been insisted upon on former occasions. Both can act at a distance, and doubtless at any distance ; but whilst gravitation may be considered as simple and unpolar in its relations, magnetism is dual and polar. Hence, *one* gravitating particle or system cannot be conceived to act by gravitation, as a particle or system, on itself; whereas a magnetic particle or system, because of the dual nature of its force, can have such a self-relation. Again, either polarity of the magnetic force can act both by attraction and repulsion ; and not merely so, but the joint or *dual* action of a magnet can act also either by attraction or repulsion, as in the case of paramagnetic and diamagnetic bodies : the action of gravity is always that of attraction. As some further relations of the sun and the earth would have finally to be submitted, the audience were reminded, by the use of Arago's idea, of the relative magnitude of the two ; for, supposing that the centres of the two globes were made to coincide, the sun's body would not only extend as far as the moon, but nearly as far again, its bulk being about seven times that of a globe which should be girdled by the moon's orbit. For the more careful study of the magnetic power a torsion balance had been constructed, which was shown, and its mode of operation explained. The torsion wire was of hard drawn platinum, 24 inches in length, and of such diameter that 28.5 inches weighed one grain. It was attached as usual to a torsion head and index. The

horizontal beam was a small glass tube, terminated at the object end by a glass hook. The objects to be submitted to the magnetic force, were either cylinders of glass, with a filament drawn out from each, so as to make a long stiff hook for suspension from the beam; or cylindrical bulbs of glass, of like shape, but larger size, formed out of glass tube; or other matters. The fine tubular extremities of the bulbs being opened, the way through was free from end to end; the bulbs could then be filled with any fluid or gas, and be re-submitted many times in succession to the magnetic force. The source of power employed was at first a large electro-magnet; but afterwards, in order to be certain of a constant power, and for the advantage of allowing any length of time for the observations, the great magnet, constructed by M. Logeman upon the principles developed by Dr. Elias, (and which, weighing about 100 lbs., could support 430 lb., according to the Report of the Great Exhibition Jury), was purchased by the Royal Institution and used in the inquiries. The magnet was so arranged that the axis of power was five inches below the level of the glass beam, the interval being traversed by the suspension filament or hook, spoken of above. When a body is submitted to the power of a magnet, it is affected as to the result, not merely by the magnet, but also by the medium surrounding it; and even if that medium be changed for a vacuum, the vacuum and the body still are in like relation to each other. In fact the result is always differential; any change in the medium changes the action on the object, and there are abundances of substances which when surrounded by air are repelled, and when by water, are attracted upon the approach of the magnet. When a certain small glass cylinder, weighing only 66 grains, was submitted on the torsion balance to the Logeman magnet surrounded by air, at the distance of 0·5 of an inch from the axial line, it required 15° of torsion to overcome the repulsive force and restore the object to its place. When a vessel of water was put into the magnetic field, and the experiment repeated, the cylinder being now in the water was attracted, and 54°·5 of torsion were required to overcome this attraction at the given distance of 0·5. If the vessel had contained a fluid exactly equal in diamagnetic power to the cylinder of glass, neither attraction nor repulsion would have been exerted on the latter, and therefore the torsion would have been 0°. Hence the three bodies, air, glass (the especial specimen), and water, have their relative force measured in relation to each other by the three experimental numbers 15°, 0° and 54°·5. If other fluids are taken, as oil, ether, &c., and employed as the media surrounding the *same glass cylinder*, then the degrees of torsion obtained with each of them respectively, shows its place in the magnetic series. One great object in the construction of an instrument delicate as that described, was the investigation of certain points in the philosophy of magnetism; and amongst them especially, that of the right application of the law of the inverse square of the distance as the universal law of magnetic action. Ordinary magnetic action may be divided into two kinds: that between magnets permanently magnetised and unchangeable in their condition, and that between bodies of which one is a permanent unchangeable magnet, and the other, having no magnetic state of its own, receives and retains its state only whilst in subjection to the first. The former kind of action appears in the most rigid and pure cases, to be subject to that law; but it would be premature to assume beforehand, and without abundant evidence, that the same law applies in the second set of cases also; for a hasty assumption might be in opposition to the truth of nature, and therefore injurious to the progress of science, by the creation of a preconceived conclusion. We know not whether such bodies as oxygen, copper, water, bismuth, &c., owe their respective paramagnetic and diamagnetic relation to a greater or less facility of conduction in regard to the lines of magnetic force, or to something like a polarity of their particles or masses, or to some as yet unsuspected state; and there is little hope of our developing the true condition, and therefore the cause of the magnetic action, if we assume beforehand the unproved law of action and reject the experiments that already bear upon it:—for Plücker has distinctly stated as the fact, that diamagnetic force increases more rapidly than magnetic force, when the power of the dominant magnet is increased; and such effect is contrary to the law above enunciated. The following are further results in relation to this point. When a body is submitted to the great unchanging Logeman magnet in air and in water, and the results are reduced to the centigrade scale, the relation of the three substances remain the same for the same distance, but not for *different* distances. The result of experiment proves that the greater the distance of the diamagnetic bodies from the magnet, the more diamagnetic is it in relation to water, taking the interval between water and air as the standard: and it would further appear, if an opinion may be formed from so few experiments that the more diamagnetic the body compared to air and water, the greater does this difference become. At first it was thought possible that the results might be due to some previous state induced upon the body, by its having been nearer to or further from the magnet; but it was found that whether the progress of the experiments was from small to large distances, or the reverse; or whether, at any given distance, the object was previous to the measurement held close up to the magnet or brought from a distance, the results were the same;—no evidence of a temporary induced state could in any of these way be found. It does not follow from the experiments, if they should be sustained by future researches, that it is the glass or the bismuth only that changes in relation to the other two bodies. It may be the oxygen of the air that alters, or the water, or more probably all these bodies; for if the result be a true and natural result in these cases, it is probably common to all substances. The great point is that the three bodies concerned, air, water, and the subject of the experiment, alter in the degree of their magnetic relations to each other; at different given distances from the magnet the ratio of their magnetic power does not, according to the experiments, remain the same; and if that result be confirmed, then it cannot be included by a law of action which is inversely as the square of the distance. The cause of this variation in the ratio of the substances, one to another, if it be finally proved, has still to be searched out. It may depend in some manner upon the forms of the lines of magnetical force, which are different at different distances; or not upon the forms of the lines but the amount of power at the different distances; or not upon the mere amount, but on the circumstances that in every case the body submitted to the experiment has lines of different degrees of force passing through different parts of it, (for however different the magnetic or diamagnetic conditions of a body and the fluid surrounding it, they would not move at all in relation to each other, in a field of equal force:) but whatever be the cause, it will be a concomitant of magnetic actions; and therefore ought to be included in the results of any law by which it is supposed that these actions are governed. On the present occasion a passage was quoted from Newton which had since been discovered in his works, and which, showing that he was an unhesitating believer in physical lines of gravitating force, must from its nature, rank him amongst those who sustain the physical nature of the lines of magnetic and electrical force: it is as follows, in words written to Bentley:—"That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without mediation of anything else, by and through which their action and force may be conveyed from one to another, it is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers." Finally, reference was to be made to Sabine's remarkable observation, sustained as it has been by Wolf, Gautier, and others, of certain coincidences existing between the appearance of solar spots and the diurnal variation of the magnetism of the earth. Schwabe has been engaged in carefully observing the spots on the sun since the year 1826. He has found them gradually to increase in number and size from year to year, and then decrease, and so on in a regular period of about ten years. Lamont (Dec. 1851) was induced by recent researches in atmospheric magnetism, to examine the daily magnetic variation in declination, and found that, as a whole, it increased and diminished, and then increased again, having a regular variation of about ten years: the year 1844 was given as a minimum variation of 6'·61 and the year 1848 as presenting a maximum variation of 11'·15. Sabine (March 1852) in searching for periodical laws amongst the mean effects of the larger magnetic disturbances, found a simultaneous period of increase and decrease both at Hobarton and Toronto, on opposite sides of the globe; the minimum effect was in 1843, and the maximum effect in 1848, according therefore almost exactly with Lamont's observations at Munich. But, besides that, he pointed out the extraordinary circumstances that this similar variation of the daily magnetic declination is the same in length of period as that discovered by M. Schwabe for the solar spots; and still more that the maxima and the minima of these two most different phenomena coincide; for 1843 presents the least diurnal variation and the smallest number of solar spots, and 1848 the largest magnetic variation and the greatest number of solar observations. He has observed that the same period of increase and decrease exists with the same epochs in the diurnal variations of the magnetic inclination of the earth's magnetic force in both hemispheres. The phenomenon is general both as regards all the magnetic elements, and in parts of the globe most distant from each other. Gautier appears to have been struck with the same coincidence; but did not publish his idea until July 1852. Wolf, of Berne, who has sought far into the history of the sun spots, had the same thought, publishing it first at the end of July or beginning of August, 1852. He endeavours to trace the general condition of the spots from the year 1600, and concludes that the true length of the period is 11·11 years. As it is impossible to conceive such a coincidence in the length of the period and the time of the maxima and minima of these two greatly differing phenomena, without believing in some relation of them to a common cause; so, the observation of such a coincidence at this moment ought to urge us more than ever into an earnest and vigorous investigation of the true and intimate nature of magnetism; by means of which we now have hopes of touching in a new direction not merely this remarkable force of the earth, but even the like powers of the sun itself.

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The Canadian Journal.

TORONTO, APRIL, 1853.

On the Probable Number of the Native Indian Population of British America: Captain J. H. Lefroy, Royal Artillery.

(READ BEFORE THE CANADIAN INSTITUTE, MAY 1, 1852.)

There are probably few persons who, in the course of their reading in history, have not dwelt with peculiar interest upon the glimpses we catch through the mists of the past, of whole races of men that have vanished from the face of the earth, leaving no heirs or representatives to inherit the richer blessings of our age: of nations whose part in the great drama of human life we can never ascertain, whose sages are forgotten, whose warriors lie with "the mighty that were before Agamemnon" in the obscurity of oblivion. Then we may remember "how small a part of time we share" whose interests are so momentous for eternity; and may recognize, in the force of our sympathy, in the eagerness with which we interrogate the monuments that have descended to us; in the curiosity which all their reserve cannot baffle; a testimony to the truth of the declaration of the sacred historian, that the Creator 'hath made of one blood all the nations upon earth'; as well as the tie of relationship which unites all the descendants of our common parents, whatever their place in the stream, or their fortunes on the stage of life.

Naturalists have been able to number some half-dozen birds or animals that have become totally extinct within the period of authentic history. We have lately seen what general rejoicing, the discovery of a living specimen of one previously ranked in that number (the *Apterix)*, has created among them. The skull, the foot, and a few rude pictures of the Dodo, have furnished ample material for a quarto volume. How many might be written on the varieties of the human race that have ceased to exist within the same period! The Dodo was perfectly common at the Isles de Bourbon two centuries ago, it was neglected, hunted down, exterminated accordingly: and the Dutch seamen who made an easy prey of whole flocks, twenty or thirty at a time, in 1602, (the Dodo, page 15,) no more suspected that we should now be ransacking all the museums of Europe for scraps to elucidate its affinities, than the first settlers of Newfoundland did that we should also be seeking in vain for one relic of its aborigines. When happy and hospitable crowds welcomed the Spaniards to the shores of Hispaniola, those cavaliers little dreamt that in three centuries or less the numerous and warlike Caribs of that Island, like the Gauchos of the Canaries, would be extinct, as completely so as the Architects of the Cyclopean remains of Italy, or the race that preceded Saxon and Dane, and Celt, in the occupation of the British Isles. In half a century there will be no trace of a native race in some of the British colonies in the east. The natives of Van Dieman's Land, for example, who numbered 210 in 1835, were reduced to 38 in 1848.* It even appears doubtful, whether that most interesting of all savage races, the Maoris of New Zealand, with its wonderful force of character, and faculty for civilization, will not die out faster than it can conform to its altered condition. Like those silent yet ceaseless operations of nature, which are wearing down, while we speak, the solid matter of every mountain chain, and water course on the globe, and substituting the luxuriant vegetation of the tropical coral reef for the barren waste of the sea; so, slowly and imperceptibly, are the great changes effected, by which one race supercedes another in the occupation of portion after portion of the globe, bringing higher qualities, a different moral and physical organization, to work out higher destinies, and fulfil higher ends of the same controuling Providence.

These reflections have been suggested by the subject of the paper which I now propose to lay before this Society, containing the result of some enquiries I have made with a view to forming something like an authentic estimate of the number of the Indian race inhabiting the British possessions in America. A portion only, it is true, of the whole race, yet one which by reason of the great extent of those possessions, is commonly regarded as a very important one. If, as I think, it can be shown, that number is vastly smaller than most persons would suppose, and very rapidly diminishing, under circumstances which are nevertheless by no means unfavourable to its preservation; then it must be admitted that the prospects for the race at large are anything but encouraging—that the time may not be far remote when posterity may be counting its last remnants, and wishing that we in our day had been more alive to the facts, and more industrious in setting up marks by which they might measure the ebbing tide, and comprehend the destiny about to be consummated.

What constitutes density of population, is a question not easy to answer, when it relates to civilized communities, so wonderfully has Providence ordained that with fresh demands, and the heavier pressure of necessity, fresh resources should be found in nature for human sustenance; but in reference to uncivilized man, linked to nature by stronger ties, and having his existence bound up as it were, with those of her provisions which do not greatly vary from age to age, and are not so beyond our means of estimation, it does not seem impossible to assign limits beyond which his numbers can never far extend, and within which there is no reason that they should much vary, unless by the operation of external causes. However, I have no intention of attempting such an estimate here. We have evidence in the great Earthen Works of Ohio, requiring an immense number of hands for their erection, that at some period a considerable population occupied the fertile vallies of that region. We know that Agricultural pursuits prevailed among many tribes, which have since almost completely abandoned them; but with all this, it is difficult to avoid the conclusion, based on the desolating habits of Indian warfare, on the severity of the climate, and on the degraded position of the female sex, that upon the whole, the population of the middle and northern portion of the continent must, at all times, have been small in proportion to its area, and never on a par with the simplest of all natural resources, the animal life of the region. The materials for a specific estimate of their numbers at any one early period, are exceedingly scanty. The early travellers dealt in round numbers to an alarming extent. "*Qui dit un Canton d'Iroquois*" says de la Hontan, "*dit un douzaine milliers, d'ames. It s'en est trouve jusqua quatorze mille et l'on calculait ce nombre par deux mille Vieillards quatre mille Femmes, deux mille Filles, et quatre mille Enfans*." And as there were then five such cantons or Nations, this people, if the Baron or his authorities can be trusted, counted considerably less than

* Our Antipodes by Colonel G. Mundy, 1852—Vol. II.

two centuries ago, from sixty to seventy thousand souls. Yet he gives as informants persons who had lived twenty years among them. Little reliance can be placed on the estimate—the ancient *Coureurs des Bois* were addicted to romancing, and the habit of perverting facts in reference to the more remote tribes they visited, by way of discouraging rivalry in their lucrative trade, must have clung to them when discussing those nearer home. Equally apochryphal, I cannot but suspect, must be the 20,000 warriors whom King Oppecaucanough somewhat earlier, is related to have led against the settlers in Virginia. Yet these and other similar estimates, which it would be easy to multiply, if they fail to furnish a numerical basis for comparison, convey a general idea of populousness which, as compared with what is known to our times, would justify anything that can be said as to the decline of the race. "There are abundant proofs," says Catlin, "in the History of the country, to which I need not at this time more particularly refer, to show that the very numerous and respectable part of the human family, which occupied the different parts of North America, at the time of its first settlement by Anglo Americans, contained more than *fourteen millions*, who have been reduced since that time, and undoubtedly in consequence of that settlement, to *something less than two millions*." (Catlin II., p. 238.) In the elaborate alphabetical enumeration of Indian tribes and Nations, upward of 400 in number, prefixed to Drake's well-known Book of the Indians: 10th Edit., 1848.—we find the estimated numbers of a large proportion of them stated, but being of a great variety of dates, and the data probably of very variable authority, no general estimate can be based on it, without an analysis much more laborious, than the result is likely to be accurate.

In the course of a couple of summers spent a few years ago in the Hudson's Bay territory, I took pains to arrive at an estimate of the actual numbers of Indians inhabiting that country, by enquiries among the resident traders, and by procuring whenever possible, a specific statement of the number of hunters frequenting each Post, the number of young unmarried men, and an estimate of their families. The two first were, no doubt, ascertained very correctly, as far as the enquiry went; the last does not admit of much doubt. With respect to the districts which I visited but from which I did not procure these data, it is not difficult to base a tolerable approximation on the information derived from observation and inquiry, and in respect to those which I did not visit, which however form but a small part of the territory, I am guided in the estimate by the facts that where there are no trading posts, there are no Indians, and that where there are trading posts, all the Indians of the district frequent them, habit having rendered the articles of European trade essential to their existence; consequently we may infer the number frequenting any given post, pretty nearly, when the scale of the establishment is known. There are, perhaps, a few exceptions to this remark in the district of Mackenzie's River, where our intercourse with many tribes is of recent origin; but it is true almost everywhere else. Whenever a conjectural addition was made, by well-informed persons, on the spot, to the more precise numbers, it has been included in the following enumeration.

The British territory in relation to its native population, may be divided into four regions. *First.*—The region west of the Rocky Mountains, and north of the parallel of 49°. *Second.*—The region east of the Rocky Mountains, but north of the parallel of 55°; the whole of which is inhabited by tribes of a common origin, and grouped by Ethnologists under the generic designation of "Tinnè." *Third.*—The region from the parallel of 55° to 49°, occupied partly by tribes of what is called the Eythinyuwuk or Algonquin stock, and partly by tribes of an intrusive race kindred to the Iroquois or Five Nations. Lastly,—the British Colonies.

Beginning with the *Second* of these subdivisions, we have—North of Latitude 55°:

	Men.	Estimated Total.	
(1.) Esquimaux—*Inu-it* not included	Unknown.		
(2.) Loucheux—*Kutchin*			
On the Youcon and Tributaries,—			
Richardson, Artez-Kutchi	100		
" p. 234. Tchue	100		
" On the Tathzey	230		
" authority of Kutchcha	90		
" Mr. Murray Zi-Unka	20		
" Tanna	100		
" 1850. Teytsè	100		
" Vanta	80		
" Neyetsè	40		
	860		
On Peel's River, 1844	413	5000	
Fort Good Hope Mountain Indians-	75	375	
Loucheux	15	75	
Francis Lake, 1847–8	45	210	
Pelly Banks "	73	368	
		6028	
(3.) Dogribs, Hares, Chipewyans, &c. *Tinnè.*			
Fort Good Hope, Lowland Indians	28	150	
" Rapid Indians	11	55	
Fort Normon Da-ha-Dinne, Dog-rib, Hare	140	600	
Fort Simpson—Hares	107		
" Do. Irregular	320		
" Dog-rib	10		
" Do. Irregular	50		
" Nahanies	2		
" Do. Irregular	4	2400	
Fort Liard*—Hay River Indians, (Hares)	20		
" Beaver or Chipewyan	30		
" Slaves or Hares	10		
" Thecanies	30		
" Nahanies	14	600	
Fort Resolution—Chipewyans	80	420	
" Yellow Knife	51	260	
Big Island or Great Slave Lake Hares	20	100	
Fort Chipewyan, Chipewyans	140	730	
Vermilion Beaver Indians	62	250	
Dunvegan Beaver Indians	87		
" Seccanies	4		
Chipewyans	12	350	
Unenumerated Chipewyan Stations			
Churchill	100	400	
Isle a la Crosse†	110	660	
Dogrib and Martin's Lake Indians, said by Mr. Isbester, not to be decreasing in numbers	150	600	7575

*Franklin gave, in 1820, 685 hunters.

† Franklin rated them at 200 men and boys.

The foregoing enumeration, although it embraces a large extent of country, does not bring us into contact with the more numerous tribes, which are to be found only on the plains, where countless herds of Buffalo furnish ample means of subsistence. Without going into any nicety of classification, founded upon affinities of race, upon which subject Dr. Latham and Sir John Richardson, (Arctic Expedition,) have given much information the tribes are referred to here by the designations they commonly bear among the traders. Mr. Harriet, then, a gentleman who had passed his life among them, estimated the six or seven tribes going by the general name of Blackfeet, as mustering 1,600 to 1,700 tents, at 8 per tent, 13,200.

Mr. Rowand, one of the oldest resident traders, gives them thus:—Sir John Franklin's estimate in 1820, is added—

		Franklin, 1820.
Blackfeet, proper	300	350
Pe-a-gans	400	400

Blood Indians	250	300
Gros Ventre's, or Fall Indians	400	500
Circees	45	150
Cotone's } Mountain tribes		100
Small robes } Mountain tribes		150
		1645 at 8 p. t. 13,160

Mr. Shaw allowed to the Blackfeet, only 12,000

Considering that these are perfectly independent estimates, they agree remarkably, and we may take by their mean—

The Blackfeet tribes 12,900

We have next the Assiniboines, a tribe of the Sioux, and said to be of the Iroquois stock: they are distinguished into those frequenting the woods, and those frequenting the plains, or Strongwood and Plain Assiniboines:—

Mr. Harriet, in 1842, gave Strongwood	80 tents.	
Mr. Rowand gave Plain Aissiniboines	300	3,200
Mr. Shaw gave, both together		4,000
Giving for Assiniboines		3,600

	TENTS.	
For the Strongwood Crees about Edmonton, Mr. Rowand gave	100	4,000 }
Other Crees of the plains	200	2,000 }
Mr. Shaw gave		4,000
(3.) Crees		3,500
(4.) Ojibbways, or Chippewas of the Saskatchawan—Mr. Rowand	20	200

I. The aggregate, then, of the tribes inhabiting the Plains, in the British Territory, by competent authorities was, in 1843, not more than 23,400. Catlin's estimate for the same tribes, is 35,000; but I found that all his numbers were regarded by better authorities (for Mr. Catlin did not visit the region here in question,) as too high.

II. We have next the various divisions of that widely diffused race, the *Eythinyuwuk* or Crees, which form the population of the wooded country east of the Great Plains, and south of the Churchill River, extending however in some instances *on* to the one, and *north* of the other. The Crees of the Plains we have already counted. There are a few Crees trading at Fort Chipewyan, at Isle a la Crosse, and at Lesser Slave Lake.

	Families.	Souls.
At Fort Chipewyan	26	140
" Lesser Slave Lake	83	341a
" Isle a la Crosse, and Green Lake	100	600
" Cumberland House		300*
" The Pas, or Basquau		150*
" Norway House		300*
" Oxford House		100*
" York Factory		200*
" Beren's River		100*
" Red River dependencies		2000*
" Albany River, Martin's Falls		500*
" Moose Factory and outposts		500*
" Lake Tamiscaming		200*
		5431

(a) About one-third half-breeds. * Estimates only.

To this division belong the Chippewas or Ojibwas, Saulteurs and Tetes de Boule of Lake Superior, Lake Huron, and their tributary waters. It was ascertained by the Honourable W. B. Robinson, Indian Commissioner in 1851, that the Indians on the north side of Lake Superior, from the Sault St. Mary to Pigeon River, and inland as far as the possessions of the Hudson's Bay Company, forming 6 bands, or sub-divisions, were in all 1102 souls; and that the Indians on the north side of Lake Huron, from the Sault to French River, forming 17 bands, amounted to 1,422 souls, giving a total of 2,521. The bands were found to vary much in number, some comprising no more than 15, some as many as 241 souls. We have then—

	SOULS.
Brought forward	5431
At Fort Alexander—Lake Winnipeg	200*
" Rat Portage—Lake of the Woods	120*
" Fort Francis—Rainy Lake	400*
" Lake Superior as above	1,102
" Lake Huron as above	1,422
	8,675

With respect to the Indians in Canada proper, it is stated, in a very interesting Report concerning them, (Journals of House of Assembly, 1844-'5, Appendix 2,) that the earliest document received by the Government, which contains any detailed statement relative to the tribes, is one prepared by Major-General Darling, Military Secretary to Lord Dalhousie, in 1828. The total number of Indians who then came under the observation, and within the influence of the Government, in both Provinces, did not exceed 18,000. I am indebted to Col. S.P. Jarvis, late Indian Superintendent, for the following authentic returns of their more recent numbers. In 1835, the number of resident Indians receiving presents, as they are improperly called, being rather annuities or rent charges upon the soil of Upper Canada, was stated as follows:—

TABLE I.

	Men.	Women	Boys und'r 15.	Girls und'r 15.	Total.
Iroquois, or Six Nation Indians, including the Mohawks on the Bay of Quintè	598	727	543	545	2413
Hurons, or Wyandots	25	25	10	18	78
Chippewas	414	438	313	276	1441
Chippewas, called Mississaugas	208	246	157	125	736
Munsees, Delaware, or Lenne-lenape	44	51	36	26	158
Moravian Indians	78	79	55	44	256
	1397	1566	1114	1035	5082

The following Table contains a statement in detail of the Indians in Upper Canada in 1838, compiled from a return made in answer to enquiries of the Secretary of State for the Colonies (Lord Glenelg.) The corresponding numbers in 1844 and 1846, where they are given under the same denomination, are added from the returns of the Indian Department.

TABLE II.

Indians of Upper Canada. The details are from the very complete returns of 1838, *unless otherwise stated; and where corresponding totals are not given for the years* 1844 *and*

1846, *it arises from a more general form having been adopted in those years.*

	DENOMINATION.	1838.					1844	1846
				Under 15.				
		Men	Women	B'ys	Girls	Tot.	Tot.	Tot.
	CHIPPEWAS.							
1	St. Clair Rapids	113	124	84	85	396	197	
2	Walpole Island or Chenail Ecarté	47	60	28	39	176	307	a. 1129
3	R. aux Sables Lake Huron.	11	6	4	10	27	117	
4	Up. St. Clair from Saginong.	80	92	68	52	312	"	
	The same in 1844	218	234	159	130	"	741	684
5	Amherstburg	28	32	25	15	100	258	a. 494
6	Delaware, River Thames	121	120	79	57	377	378	438
7	Manitoulin Island L. Huron	64	61	25	38	188	"	" a.
	The same in 1846	284	330	229	255	"	"	1098
8	LaCloche & Mississaugeen.	69	77	59	20	225	"	"
9	St. Joseph's Island L. Huron	23	26	17	24	90	"	"
10	Sault Ste. Marie	24	36	19	20	99	"	"
11	East Shore of Lake Huron.	68	59	49	26	202	"	"
12	Owen's Sound, in 1846...	42	54	20	20	"	"	139
13	Saugeen, Lake Huron	55	57	55	51	218	"	209
14	Yellowhead's Tribe, Rama	83	103	35	21	242	267	327
15	John Aisence's Tribe, do..	54	74	36	20	184	211	213
16	Lake Nipissing	18	16	10	15	59	"	"
	MISSISSAUGAS.							
17	River Credit, L. Ontario...	68	77	52	43	240	254	245
18	Rice Lake	35	47	28	25	135	145	151
19	Mud Lake: Balsam Lake..	45	52	35	27	159	175	194
20	Alnwick; on Rice Lake, from Grape Island	63	71	45	35	214	233	218
21	Bedford, near Kingston 1846	26	24	10	19	"	"	79
	IROQUOIS OR 6 NATIONS *On the Grand River.*							
22	Mohawks, Upper	81	105	87	90	363	374	406
23	" Lower	67	72	60	61	260	310	336
24	" from the Bay of Quinté	19	24	23	25	91	94	88
25	" on the Bay of Quinté.	87	74	77	99	337	354	415
26	Oneidas, Joseph's	16	19	5	17	57	42	42
27	Onondagas, Clear Sky	51	68	36	25	178	219	225
28	" Bear or Barefoot.	17	28	11	12	68	64	56
29	Senecas, Nekarontasas...	8	13	11	10	42	55	70
30	" Kaghneghtasas.	13	18	13	10	54	52	43
31	Cayugas, Upper..	45	31	23	25	124	114	117
32	" Lower	105	97	48	69	319	287	311
33	Tuscaroras	38	55	30	39	162	192	202
34	Aughquagas, Joseph's....	13	22	18	17	70	82	67
35	" Peter Green	23	22	20	22	87	75	68
36	Tutulies or Tutiloes	15	17	6	9	47	40	32
37	Minor denominations	12	28	22	25	87	96	102
	OTHER TRIBES.							
38	Ottawas, Manitoulin Island	26	22	14	18	80	"	"
39	Hurons or Wyandots	34	21	13	17	85	88	"
40	Munsees or Delawares...	2	2	1	1	6	22	"
41	" on River Thames.	64	74	55	49	242	242	157
42	" on Grand River...	42	54	18	26	140	127	122
43	Potawatomies, at Saugeen.	55	57	55	51	218	"	"
44	" St. Clair Rapids, 1844	141	170	101	94	"	507	"
45	" Upper St. Clair, 1846.	27	33	21	14	"	"	95
46	Shawanoes, at Amherstb'g	2	4	"	"	6	"	"
47	Moravian Indians, River Thames	41	42	[illegible]	31	143	143	187

(a) Potawatomies and Ottawas are here included.

(b) Two bands called the old and the new, or Young Nanticokes, are included in these; they numbered 29 and 17 souls, respectively, in 1844.

The total numbers, as they appear at the foot of the above Returns, exclusive of what are termed visiting Indians, most, or all of whom, come from regions beyond Lake Superior, and, if British Indians, are included elsewhere—are as follows:—

TABLE.

	1838	1844	1846	1847
Deserving Chiefs	52	31	29	
Warriors.	38	38	51	
Women ..	62	41	41	
Ordinary Chiefs.	134	162	178	
Warriors .	1712	1274	2207	
Women ..	2091	2131	2599	
Boys 10 to 15 years..	422	492	573	
5 to 9 "	430	475	595	
1 to 4 "	553	433	690	
Girls 10 to 14 years	310	421	455	
5 to 9 "	442	444	567	
1 to 4 "	497	481	773	
Totals	6643	6874	8756	8862

The Chiefs and Warriors in the first class, are those who served in the last war. The numbers in 1847 are taken from the Quebec *Gazette*. The apparent increase in 1846 is due to the permanent settlement of many Indians within the Province, previously residing beyond its limits, and was occasioned, as is well known, by the objection made on the part of the United States to our continuing to supply arms and ammunition to friendly natives belonging to their territory, the details of the table however, when they are comparable, give satisfactory grounds for supposing that as regards the small portion of the Indian race inhabiting Canada, the worst is over. They appear to be slightly on the increase, and are at the same time acquiring to some extent, the habits of civilized life.*

The following Table, of the number of Indians in Lower Canada, is taken from the Report presented to the Legislative Assembly, 1845, (Journal 1844–5—App. 2) to which reference has been made before:—

DENOMINATION.	Men	Women	Boys.			Girls.			Tot.
			15 to 10	9 to 5	under 5	15 to 10	9 to 5	under 5	
Iroquois, Caughnawaga	266	306	61	67	72	53	66	64	955
" St. Regis, L. St. Francis	118	127	33	35	33	17	33	54	450
" Lake of Two Mountains	87	103	17	19	24	22	21	23	316
Algonquins, Lake of Two Mountains	95	116	23	20	19	29	26	5	332
" near Three Rivers.	25	34	5	9	10	3	3	9	92
Nipissings, Lake of Two Mountains	75	85	23	15	12	17	29	7	263
Abenaquais, St. Francis	100	111	14	27	32	14	26	26	353
" Becancœur	24	33	7	5	3	2	7	2	84
Hurons or Wyandots, la Jeune Lorette	64	55	8	6	11	16	13	16	189
Tetes de Boule, St. Maurice	31	22	1	10	8	6	6	3	86
Micmacs, Abenequois, and Amaleites, of uncertain residence.	65	66	11	7			3	28	180
Totals	950	1058	203	220	224	179	233	234	2401

* The fact that the Mohawk Chief, John Brant, was once elected member of the House of Assembly, although he lost his seat for want of sufficient freehold property, deserves to be remembered.

It is to be regretted that the Lower Canadian returns do not distinguish the Iroquois according to the distinct nations of that once powerful confederacy. It will be observed, however, that the above numbers, combined with those of the Upper Canada return for 1846, make the number of chiefs and warriors still to amount to 1,220, and the total number to 4,301*. That their ancient loyalty to the British Crown is unabated, was shown by many incidents of the Canada rebellion, and by the language of their chiefs on the very interesting occasion of the meeting to restore General Brock's Monument in 1841. There is no native race entitled to claim, on so many grounds, the interest and respect of British inhabitants of Canada.

The following numbers of Indians in the several *Counties*, taken from the Census Returns of 1852, are added, to bring down the information on that subject to the latest date. It is evident, however, that the enumerators in Upper Canada did not always distinguish them from the rest of the population. There are, for example, none returned for the Counties of Lambton and Essex, on the St. Clair,—thus the total is far below the truth,—but the list appears to be complete for Lower Canada.

UPPER CANADA. 1852.		LOWER CANADA. 1852.	
Brant	1758	Beauharnois	754
Carleton	20	Bonaventure	451
Dundas	54	Champlain	31
Grey	374	Drummond	27
Grenvillle	48	Huntingdon	1259
Haldimand	310	Kamouraska	55
Kent	259	L'Islet	21
Northumberland	222	Megantic	14
Peel	12	Montmorency	26
Perth	8	Ottawa	5
		Portneuf	12
		Quebec	218
		Rimouski	103
		Saguenay	663
		Terrebonne	11
		Two Mountains	408
	3065		4058

The number of Indians on the lower St. Lawrence, frequenting the King's posts of the Hudson's Bay Company, is not known, but must be insignificant. I believe this to be also the case of the Indians in Nova Scotia and New Brunswick, but have no access, at present, to authentic returns.

We have still to consider the population west of the Rocky Mountains, in New Caledonia.

In 1820 Harmon, who had lived long among them, stated that the number, of all ages, did not exceed 5,000; they have diminished since with fearful rapidity, probably faster in that quarter than in any other. Mr. McGillivray, in Ross Cox's Travels, of somewhat earlier date, makes the tribes inhabiting the country about Frazer's River, the most populous part of the country, to number no more than 1,012 souls, including the Chilcotins, Naskotins, Tolkotins, and Atnahs—four tribes. Commodore Wilkes in 1840, upon a very careful survey, and doubtless upon much more complete and authentic data, than either of the others, makes the total population of Oregon and New Caledonia together, amount to 19,354 souls, about two-thirds of what M. Duflot de Mofras estimates for Oregon alone. So that on the whole, I consider that 2,000 for the interior of New Caledonia, (Oregon no longer being British territory,) is an ample allowance.

We have also to include the large Islands of Quadra or Vancouver's, and Queen Charlotte, together with the seaboard of that region. The population of the former has been estimated at from 10,000 to 20,000, and that of the latter at from 7,000 to 10,000.

By the kindness of Mr. Kane, whose labours as an artist in the least known parts of this continent, have yet to be fully appreciated, I am enabled to present an abstract of a very full census of Indian tribes inhabiting the north-west coast, which he procured in 1847. If it can claim anything like the general accuracy and fidelity of his pictures of Indian life, we need not hesitate to adopt it.

TABLE III.

Common Designation among the Traders.	Tribes.	Adults. Men.	Adults. Wo'en	Children. Boys.	Children. Girls.	Slaves.	Houses.
*Nass Indians	4	543	438	314	308	12	32
Chimseyans	10	737	778	465	466	68	257
Skeena Indians	2	131	72	64	59	7	30
Sabassas	5	474	407	243	194	111	
†Milbank Sound Ind'ns	9	1007	961	394	462	47	122
‡Chilcat, &c.	7	1249	961	469	418	479	
§Stekene Indians	8	562	410	240	190	144	59
*Port Stuart	3	180	185	141	156	15	37
‖Kygarney	6	431	454	414	436		111
*Queen Charlotte Sound	6	1029	1035	962	1003		257
†About Queen Charlotte Sound	25	7370	8890	9949	11491	1372	735
Cape Scott and vicinity	4	730	8 5	1290	1290	210	74
Total		14443	15466	14972	16474	2485	1724

* Trade at Fort Simpson, Vancouver's Island, and generally reside in its vicinity.
† Trade at Fort McLaughlin.
‡ Trade at Sitka, Stikene and Tacca.
§ Trade generally at Stikene, but frequently visit Fort Simpson.
* Trade generally at Fort Simpson.
‖ Frequent Fort Simpson, Stikene, Zacca and Sitka.
* Frequent Fort Simpson.
† Frequent Fort McLaughlin.

I confess that I was not prepared for the comparative density of population evinced by this table: it makes, in fact, the north-west coast the great centre of the Indian race at the present day; and the very detail of the returns from which it has been compiled, almost provokes a doubt of their accuracy. Mr. Kane had them however from the highest authorities—and his own observation confirms the general fact. I adopt the result therefore as entitled to confidence—and it gives for the Indians inhabiting the north-west cost of America, including, however, in part, the Russian Territory, of which the Hudson's Bay Company has at present the partial occupation, for trading purposes—a total of no less than 63,340.

We may now proceed to reckon up the result, not forgetting that the region under discussion is equal in extent to nearly one-twentieth part of the habitable surface of the globe, and has been generally looked upon as the asylum and stronghold of the race of North American Indians. Excluding the Esquimaux, whose numbers, notwithstanding the great extent of sea-line they occupy, cannot be large—probably not more than two or three thousand, we have the following enumeration:—

Chipewyan tribes—namely, Chipewyans proper, Dog-ribs, Hare or Slave Indians, Yellow Knives, Beaver

*The Mohawks of the Bay of Quintè are included, but the Delaware of the Thames are excluded, as never belonging to the Six Nations although at present associated with them in all the returns of the Indian Department.

Indians, Da-ha-dinnies, and Carriers	7,575
Northern Indians of the *Kutchin* stock	6,082
Ethiny-u-wuk Indians of the Plains	23,400
Chipeways and Crees, exclusive of the above	8,675
Indians of the Seaboard and Islands of the Pacific	63,840
Indians of New Caledonia—Interior	2,000
Indians of Canada	13,000
Grand Total	124,518

Or to drop the appearance of precision conveyed by the broken numbers, 125,000, being barely double the number at which de la Hontan estimated the six Nations of the Iroquois alone, in 1690.

I am conscious that this number, for the gross population of so large a portion of the whole Continent, may appear almost incredibly small. In going over carefully and re-considering the details, I do not believe them to be, upon the whole, under estimated; no important region of the British territory appears to be omitted. It is presented, therefore, as an approximation, which may at least serve to direct further attention to the subject. It is, of course, to be taken as representing only a portion of the race. I have no means of estimating the native population of Russian America, and we have not considered the native population of the United S ates, Texas, Mexico and Oregon. The first of these was estimated in 1835 at 330,000, which, however, I take to be too high. Mr. Cuthbertson, a naturalist travelling for the Smithsonian Institution at Washington, gives the following for the probable number of Indians on the Upper Missouri, and its tributaries, in 1850. (Fifth Annual Report of Board of Regents 1851.)

Sioux	30,000
Cheyene	3,000
Ariccaree	1,500
Mandan	150
Gros Ventres	700
Assiniboine	4,800
Crow	4,800
Blackfoot	9,000
Total	54,550

Among whom, appear to be included, some of those frequenting the British trading posts, and previously reckoned. It is scarcely possible that the Indians of the Lower Missouri, Texas and Mexico, can make up even an approximation to the 330,000 of the Baptist Committee. (Religion in America, p. 56.) Putting the whole together, it would scarcely seem that the present aggregate can be placed so high as 250,000, instead of the two millions of Catlin.

To this remnant, then, has been reduced a race supposed to have numbered from ten to twenty millions, not more than three centuries ago. "War, death or sickness hath laid siege to it," and is still laying seige at a rate in no degree less rapid than at any former period. Not to mention the cruel destruction effected by the American fur traders and trappers in the South; by utter lawlessness and wanton disregard of humanity; by Florida wars and wholesale deportations; we find that even in regions where the more obviously depopulating agencies have been held in great restraint, the process goes on. The Indians themselves are fully aware of it, and fully conscious also that the whites cannot always be directly charged with it. Sir John Richardson has given us a curious mythological tradition which serves to account for it to the Kutchin (p. 239.) A friend of mine, who conferred on the subject with a sage old native of New Caledonia, found that his only theory was that the white men's tobacco poisoned them. The white's fire water in this case, and throughout the Hudson's Bay Territory, is happily guiltless, for none enters the country.* If we charge it, in the case of the Carrier, to the unbounded licentiousness which prevails among them, we have to account for the same causes not having had the same effect at earlier periods; for, with the sole exception of the Indians of Virginia, boundless licentiousness appears to have been the rule among the natives on our first acquaintance with them. The travels of Lewis and Clerk beyond the Mississippi, only half a century ago, fully corroborate the accounts of all travellers of the seventeenth century in Canada and the more Eastern regions, in respect to this characteristic.

Doubtless, some causes can be assigned which tend to reduce the physical stamina of the race—such as the substitution of inferior European clothing for their native robes of fur; the use of stimulants, tobacco almost universally, alcohol partially; the gradual loss of native arts and appliances, without the acquirement of anything better; the introduction of new forms of disease; a marked deterioration in their dwellings, from the skins of which they were formerly made, acquiring a market value, but being exchanged for nothing so essential to their health. There are also moral causes tending to depress the race—such as the consciousness of decline; the pressure of new necessities; the hopeless sense of inferiority to the whites in many respects, which, with all their reputed pride, is a general feeling among the Indians. Lastly, we must add the influence of practices which have a frightful prevalence in certain districts. I mean the administration of potions destined sometimes to produce abortion, sometimes to cause absolute sterility, in females. Dr. Hodder, in an Essay on the Poisonous Plants of Canada, read since the date of this paper, has alluded to the former as one of the secrets of the Indians in Canada, which he has not succeeded in discovering, but to which he attributes, in a very great degree, their decrease in number. Many instances of the latter were related to me in the interior—the Crees, more particularly, have a bad eminence as medicine men, which, shews a general disposition among them to these unnatural arts. In fact they are stated to be among the commonest resources of jealousy and revenge. However, some of these causes have not been found to check the reproductiveness of other races; and it may be doubted whether any or all of them are adequate to explain the broad fact, the final solution of which can probably be found only in the supposition of a design of Providence to make way for one race by removing the other.

* I cannot avoid referring Temperance advocates to the amusing Essay, "Sur l' Yvrognerie des Sauvages," in the Histoire de l'eau-de-vie en Canada, 1705; re-printed by the Literary and Historical Society of Quebec. It is well to know that, *il n'y a qu'une mesure d'yvresse qu'ils appellent* Ganontiouaratonseri, c'est a dire, *Yvrognerie pleine!*

The Horse and its Rider.

BY J. BAILEY TURNER, ESQ., QUEBEC.

It may as well be mentioned here, that the several original breeds or stocks of the horse are evidently, though cursorily alluded to in several places in Scripture, both in the vision of the ancient Hebrew Prophets, and in the Revelations of St. John. In the 1st chapter of Zechariah, and the 8th verse, the bay Syrian race, the white Armeno-Persian, and the piebald Maccedonian, are evidently referred to in these words:—"I saw by night, and behold a man riding upon a red horse, and he stood among the myrtle trees that were in the bottom, and behind him were there red horses, speckled, and white." Again, in the 6th chapter of the Revelations, we have the white horse, the red, the black, and the pale horse; again, the Persian, the Syrian with the Median and Scythian, or Roman—types of the four

great monarchies, not imaginary, but taken from existing races and actual localities.

As there is no trace whatever of the existence of an indigenous breed of wild horses in Arabia or the adjacent countries, we must conclude that to great care taken in breeding and training the imported races, and to the selection of the finest forms, may be attributed the excellence of the Arabian stud—the natural quality was more fully developed by the sunny climate—the allowance of scanty but highly nutritious food, and the abstemiousness in drink—and the constant attention of the owner; and we may safely conclude that, as at this day, the superior excellence of the English horse may be attributed to the careful and judicious intermixture of races; so did the Arabs derive their small but superb chargers from the Egyptian, Persian and Armenian breeds. This may account for the fact that, in very remote times, the Arab chiefs received presents of beautiful horses from neighbouring kings with joy; not that they wanted them, but that they might add to the excellence of their own breeds. And this, too, accounts for the great intermixture of colour in the Arab races. The Arabian horse was carefully bred, and this was not, and could not have been the case among the riding nations of Higher Asia, when the immense herds ranged wild over the interminable pastures, almost independent of human intervention and control. Such a nation as this care more for aggregate number than individual value; the whole people were mounted, and in the saddle performed nearly all their necessary avocations. They crossed rivers by swimming their horses, or attaching them to rude rafts. Of all the human families, this alone eat the flesh of the horse; they drank the milk of their mares, and discovered how to form from it an intoxicating beverage. On horseback the marriage ceremony was performed; on horseback the Council of the nation debated its affairs ; treaties of peace and declarations of war were dated from the stirrup of the Chaghan. In our own times the Polish nobles met on horseback to elect their king. Among many of the Riding nations the horse, man and colt, were fixed standards of value, as the cow was among the Celtic tribes; and they invented the bridle, saddle and stirrup, and probably the horse-shoe, of which latter we shall speak more at a future period. Tahtar tribes at various periods in history, from the time of Attila to the 13th century, poured their swarms of cavalry westward, penetrating northward to Silesia, and southward to the Nile; twice, in the middle ages, they passed eastward, invaded and conquered China. There is no nation at this day that can oppose an equal force of cavalry to Russia. A cavalry officer of rank, in Canada, told me that he saw 60,000 Russian horsemen reviewed at one time by the Emperor Nicholas; and that among these there were very few Cossacks. Yet, just before the French Revolution, the Russian cavalry could not stand before the Turks, unless in squares eight deep, with guns at the angles, and the fronts further protected by portable *chevaux de frizes*, and even then they were often broken by the furious charge of the Spahis.

When all these facts are carefully compared and considered, no doubt can exist but that the aboriginal region in which the wild horse was first subdued to the use of man, must be sought for in High Asia, about the fortieth parallel of latitude, the vast table from whence for ages past riding Nomade tribes have continued to issue, penetrating east, south and west, from periods long prior to all historical record.

It now remains to notice the various breeds of the horse as we find them mentioned in ancient writers, and rapidly trace them to our own times, it being primarily assumed that each race or tribe of men derived their own stock from the wild horses in their immediate vicinity—as the pied horse, or tangum, in the central mountains of Asia; the tarpan, or bay stock, more to the east and south; the pale horse, dun or edbach, on the banks of the Caspian; the white or villous stock, on the Euxine; and the black, or crisped-haired, in Europe: notwithstanding the intercourse among the nations in commerce, and the invasions of war, the distinctive features of these races are still to be discerned, though there has been an intermixture for 3,000 years, as clearly and decidedly as at this day distinguish the different races of men. The tarpan or bay stock, originally seated on the banks of the Caspian, was most probably that which mounted the armies of the Hyksos, the Shepherd Kings, the first horsemen invaders of Arabia and Egypt; this breed was that which fell into the hands of the Egyptians on the expulsion of the Hyksos, and afterwards into those of the Arabians, and may be considered the parent stock of the Arab stock of this day, improved, as we have seen, by the most careful breeding and training. This horse is figured on the monuments of Egypt, as about the size of the modern Arab, with a somewhat shorter back, large eyes, small ears, and clean limbs, and when the sculpture is painted, the colour is invariably red. It may be assumed that all the bay, chestnut and brown horses, are of this race, for we know that in the time of Crœsus, the Lydian cavalry were mounted on brown horses, and Lydia bordered on the region in which the Tarpan was indigenous. We find various breeds of this race mentioned in ancient writers, such as the Scenite Arabian, and the Syrian of Apamœa, at which place Strabo tells us 300 stud-horses and 30,000 brood-mares were maintained for the service of the state; in Egypt, on the Upper Nile, at Syene, and at Calambia, in Lybia, a bay stock flourished, highly spoken of by the ancients; from Egypt the bay stock followed the line of the coast through Numidia and Mauritania, where it mounted in the Roman times the armies of Hannibal, and in later days the Moorish cavalry, who introduced it into Andalusia, when they came over into Spain to make war on the Goths. This breed was also taken into Italy and Sicily by Phœnician and Carthagenian ships.

The next stock is the Median or Nisœan, a pale dun or cream-colored horse. In the time of Darius there was an immense breeding establishment at the place—Nisœa—whence it is recorded that that monarch obtained 100,000 horses to oppose the invasion of Alexander, and still left 50,000 in its pastures, which Alexander saw when he marched through that country. Other circumstances, however, lead to the conclusion that the white Nisœan was a peculiar and choice breed, originally from Cilicia, and that the majority of the horses in these famous pastures derived their origin from the Dun breed, now, as then, existing in the Ukraine, and marked down the back and on the shoulders with the bars which distinguish the ass. Several varieties of this Dun race, with the peculiar marking, are yet found in the south of Russia and east of Germany, and in the Danubian principalities, Wallachia and Moldavia; an accidental specimen is occasionally met with in the British Islands. The white horses of Nisœa were especially dedicated to the service of the Sun God, and used in the state pageants of the Persian Sultauns. A breed of white horses, curiously mottled with black, is still in existence on the Euythean Sea, and sold at high prices to the grandees of the Court of Teheran for purposes of parade.

We now come to the Tannian or Tangum, the primœval spotted stock; that is, horses of a pure white, irregularly marked with large chesnut spots; in England known as a skewbald, in contradistinction to the piebald, which is black and white. This species of the horse is still found wild in the highlands of Thibet. It was with horses of this breed that the Parthians mounted their hordes of cavalry; it was known in European legends from the arrival of the Scythian Centaurs; it constituted the cavalry of Thessaly and Thrace; of this stock was the famous charger of Alexander, Bucephalus; and lastly, we find it ridden by the Huns, who, coming from the north side of the wall of

China, were as far as we know, the last tribe of Gothic blood that reached the west about the time of Theodosius. In the time of Charlemagne the spotted breed was in great demand as chargers for the heavily armed knights. In the Homeric ballads they are called "variegated and swift-footed;" Statius describes them in the same terms, and distinctly tells us that they were reputed to have descended from the Centaurs, and we also find a similar account in Virgil.

It is unnecessary to enter into any minute detail of the varietie of the horse found at later periods in Greece and Italy, after the extensive commercial intercourse that obtained throughout the Mediterranean and the adjacent countries in the most flourishing ages of those great monarchies. It is sufficient to say that they can all be traced either to the bay, white, dun or dappled stock, all of Central Asiatic origin. The fifth variety is the crisp haired sorts or black stock, which became known to the world only when Roman valour had carried the Imperial Eagles to the Rhine, Danube, and Britain. The Helvetian and Gallic horses were marked by the same characters, and were believed to be indigenous—they were long-backed, high-hipped and heavy maned, with small eyes and thick lips. In Guelderland and on the Lower Rhine there was found a lighter and cleaner limbed horse of the same colour, which the Romans imported for military purposes, but that wealthy and warlike people procured during the times of the Emperors horses from almost every part of the known world, hence the great intermixture of the European races, and it is certainly remarkable that notwithstanding this the varieties of race can still be so accurately traced. In the British Islands there was an indigenous horse, of very small size, at the time of Cæsar's invasion, and found wild for many years after in many parts of the island; relics of this race may still be traced in the Welsh, New Forest, Dartmoor, and Scotch ponies. The first intermixture in England was without doubt with the various breeds imported by the Roman invaders, and then with those of the Anglo-Saxon, Danish, and Norman conquerors. Having now rapidly run through the detail of what are considered by natural historians to be the five primitive stocks or races from which all the modern breeds are derived, I will proceed as shortly to notice the most celebrated modern breeds, beginning with the Arabian, because it is to Arabian blood that England owes her superiority in horses. I have already stated that the horse was not originally found in Arabia—that it was probably, nay, almost certainly derived from the Scythian Hyksos invaders—that it was of the Tarpan or Bay primæval stock, and that to climate and great care in feeding and breeding it owes its present excellence, unrivalled indeed in the world, except by the English race-horse, originally bay, is now found of nearly all colours, though the bay still predominates—and this is owing to its having been crossed at different times with the other races, particularly with the white or grey stock from Persia and the black race from Tourkhistan. With horses of this race, more or less pure the whole of South-Western Asia, and the northern coasts are supplied, and as we have before stated, it was carried by the Moors into Spain. The perfection of the bay blood is due to the Arabs; though for centuries they have bred, in and in, as it is termed, from their own stocks, they still produce horses unrivalled in form, with fine bone, firm sinewy legs, limbs small and hard, elastic and close-grained muscle, every part of the animal free from vascular superabundance and useless weight. The Arab is generally rather narrow-chested, but the band is well expanded, the head small and most beautifully set on, the eyes large, soft, yet brilliant; the ears firm and beautifully pointed, every blood vessel prominent beneath the silken coat; though the English race-horse is fleeter, no animal in the world has more speed combined with endurance than the Arabian horse, and they are remarkably kindly tempered and intelligent. Among the Arabs themselves, it is said proverbially, that the land of Nedgid claims the noblest—Hedjas the handsomest, Yemen the most enduring, Syria the richest in colour, Mesopotamia the most gentle, Egypt the swiftest, Barbary the most prolific, Persia and Kurdistan the most warlike. At present the five recognized races are the Tanweya, Monakge, Kohayl, Saklawge and Zulfer—the matter is, however, involved in some obscurity, the very best breeds being classed together as Kochlani, their genealogy preserved with great care, and claiming for them an unbroken descent from the stud of King Solomon; some Arabs, of great piety, aver that the five races are descended from the five favourite mares of their prophet Mahomet.

The next conspicuous breed of the Tarpan stock is the Morocco Barb, intermixed, as among the Arabs with a few greys, and some blacks, probably introduced by the Vandel conquerors of Africa. The barb is a somewhat smaller horse than the Arab, of graceful action, with flat shoulders, round chest, joints inclined to be long, and a singularly beautiful head; they are far inferior to the Arab in spirit and speed. To the south of Morocco, on the borders of the Desert we find the Shrubat-ur-Reech, or swallows of the wind, reared among the tents of the Mangrabins, they are brown horses of the Tarpan conformation, of high spirit and great endurance, but from the poverty of their owners and the barren nature of the country, always found in bad condition. In Bornou, more towards the centre of Northern Africa, there is found a fine variety of the Arab; one of these horses was brought to England a few years ago, but was so incurably vicious that his owner was obliged to destroy him. In Nubia there is a breed commonly known as the Dongola Arabian, introduced at the time of the Mahometan conquest, and of fabled descent from the five horses ridden by Mahomet and his four companions Abubekei, Omar, Atmar, and Ali, on the night of the Hegria, when they fled from Mecca. These horses often rise over sixteen hands high, but the head is not well placed, the shoulders are flat, the back carped and the eyes small; the limbs are excellent in shape and very sinewy. Good horses of the Bay Tarpan race are found among the various tribes far down the eastern coast of Africa; on the Guinea Coast no horse is produced of the slightest value. At the Cape of Good Hope the Dutch settlers crossed the old black Dutch horse with an inferior Arab race, named Kadischi, the result is a small active horse, still capable of great improvement. The present Turkish horses are a mixture of Arab blood with the Armenian brown stock, but as both are of Tarpan origin it is unnecessary to say more than they are spirited and beautiful, but without vigour or durability; their skins are so irritable that they can be cleaned only with the sponge, and they are extremely docile. The Persian horse, on the frontiers between that country and Arabia is essentially an Arab: further in the interior it is strongly crossed with the Tourkoman; in form they much resemble the Arab, but have a tendency to low-neck; their endurance of fatigue is almost unsurpassed by the purest Arab. A Persian courier, if we may believe Major Keppel, rode one horse from Teheran to Bushin, 700 miles in 10 days. There are various other breeds in this region of Asia of minor value, among the small nomade tribes, but all referable to the bay stock.

In India, the bay race is not the horse of the people; it has been introduced by conquerors, and still is so, and the result is, that in India there are various breeds resulting from crosses of the native horse with Arabs and Persian studs, and of these again with blood horses brought from England, until a splendid race of Indian horses has been obtained and is rapidly increasing, and the cavalry of the East India Company is now entirely mounted on horses bred in its own establishments. As everything connected with Australia is now of interest, it may be stated that the Arab blood has been introduced into that country, and that a race of blood horses has been obtained, whose performances on the race course will bear a fair comparison with Epsom or New Market. Some years ago one gentleman in Australia had

a stud of horses 300 in number, each of which was valued at £100. Returning to Europe we find in Transylvania a superb breed of the bay stock, averaging 15½ hands, with slender bodies, fine heads, and high withers, with long silky manes and tails, and in Greece a chestnut variety of the same stock, but with a much coarser head, though of great vigour and endurance, and excellent temper.

We have already noticed the Spanish horse of this stock, imported at an early period from the coasts of Asia Minor, and highly increased in all its good qualities by the infusion of pure Arab blood at the period of the Saracenic conquest. Spain has now no good horses to boast of; the brutal order of one of Bonaparte's Marshals to disable and put out the right eye of every serviceable horse in Andalusia, and the subsequent and long-continued civil wars have utterly extirpated the once celebrated Spanish blood-horse. It must be observed, however, that in those countries in South America, once Spanish colonies, the Andalusian blood is found in all its purity, while in speed, safety of foot and endurance, the horse of the American Pampas far surpasses its European progenitors. In Jamaica there are beautiful horses of English origin, with an Arabian cross, generally brighter and smaller than the English thorough-bred, but elegant in form, fleet of foot, and gentle in temper. From the Tarpan Bay stock, originally imported from England, are derived the horses of the United States, where, towards the frontier, there is a mixture with the Canadian horse, originally brought from Normandy, and also of Tarpan descent. The English is the last on our list of horses derived from the Bay stock; and of it, it may be simply said, that at this day, whatever be the species, race horse, hunter, charger, coach horse or dray horse, it has not its superior in the world, such has been the care bestowed on the breeding and after treatment of this noble animal. From the monarch to the humblest peasant, there is hardly a man in England that does not take more or less interest in the horse, and statutes passed at different times by the earlier English Kings, and in later periods the encouragement to the production of the thorough-bred horse by the munificent kings plates given at the different races, have contributed to render the English thorough-bred horse the finest in the world, far surpassing in speed the original Arabian horse, from which the pedigree of every well-known racer can be distinctly traced. The prevailing colors of the best English horses—bay, brown and chesnut—sufficiently mark the Tarpan origin; the most celebrated race horses have been bays, with the exception of Trumpeter, a black, and some of his descendants, no horse of any other color has ever done any thing on the turf. A very few words will suffice to dispose of the remaining primitive stocks. The white or grey race, originally indigenous on the great table land of Pameie, on the Steppes to the north of the Euxine, and in Armenia and Cilicia, spread gradually over all Asia. This breed was originally of higher stature than the bay, with greater breadth and more solid limbs, and at all times mixed better with the Bay stock than any other race, and added to its bone and stature. This stock at all times attracted attention from its color, and was regarded as a fit distinction for kings and divinities; the Sun Gods of the old mythologies, Apollo, Odin and Kinsha, had all either possession of or access to the original locality of the white primæval stock, and in the migrations of the tribes, it was carried over the whole civilized world. For ages this breed has existed in the Spanish Pyrenees, the primæval companions of that race now known as the Basques, the descendants of the Ouralian Finns; we find the race again in the Lower Alps, and in the neighborhood of Arles in France, and in the Belgian Forest of Ardennes, where the worship of the Christian Saint, Hubert, the patron of huntsmen, supplanted the worship of Arduenna, a type of the Goddess Ertha; and again we hear of it in the Holy Isle of Ruga, where our Northmen fathers sacrificed white horses to their deified hero-progenitor, Odin. The distribution of this race was evidently connected with the religion of the Teutonic races, and accords with what is known of the western migration of their different tribes. The Plantagenet Kings of England paid great attention to this breed, importing grey horses from the Pyrenees and Gascony, and from a judicious intermixture of these with the Bay stock, has resulted the superb grey breed now so common in England.

The sooty, crisp-haired or black stock, originally indigenous in Europe, has, like the Bay and Grey races, now spread over the whole world. The gigantic black horses which we see in England, particularly in London, were originally derived from Flanders, and it is generally believed that the first were brought over by the Flemish knights who accompanied William the Conqueror. The great Brewer's dray horse is chiefly bred in Lincolnshire and Staffordshire, and of this stock also is the celebrated Clydesdale breed, stallions of which race have been sold for from 5 to 400 guineas. A judicious cross with the bay race has produced the superb chargers of the Queen of England's household troops, against whose weight and speed it is acknowledged that no equal number of horses in the world could stand for a moment. This race prevails through every part of Germany.

Of the Dun and Tangum, or Skewbald race, I shall say but little more than this, that neither of them have produced any marked effect on the Equine race by intermixture; the Skewbald is a worthless animal, generally speaking, devoid of all good qualities, except that of a gentle temper; the Dun is a hardy animal of great endurance, but possesses little spirit or speed. Both varieties are met with in every part of the world, and the Dun particularly in the South of Russia, where it forms the Cossack cavalry,

In conclusion, I will state that the Tarpan or Bay stock is to the Equine family what the Caucasian family is among the human race; wherever it is found it either obliterates the other races or assumes over them an indisputable pre-eminence; from it are derived the best and most beautiful horses in the wide world.

[At a late meeting of the Canadian Institute, a distinguished and highly respected member directed attention to a passage in the essay "On the Horse and its Rider," which appeared to call in question the Divine origin of a certain portion of Holy Writ. It was then distinctly stated by several gentlemen directly interested in the editorial management of this Journal, that the introduction of the objectionable passage was quite accidental and much to be regretted. In a report of the proceedings of the Institute, published a few days afterwards in a Toronto paper, notice was taken of the explanations elicited at that meeting. We find, however, that one or two of our co-temporaries have again called attention to the subject, apparently in ignorance of any explanation having been offered. We do not desire to shelter ourselves under the *"fig leaf covering,"* that we are not responsible for the sentiments of our correspondents, we wish rather to state explicitly that no one can regret the appearance of such sentiments as those alluded to, in any form or publication whatever, more than ourselves, and that their introduction into our pages was the result of misapprehension of instructions received by the person to whom the correction of the proofs was intrusted.]—(Ed. Canadian Journal.)

On the Fruiting and Flowering of Plants.

The following scanty notes of a few of the phenomena to which the article, on page 182, in the March number of the Journal refers, may serve to assist persons commencing this very interesting class of observation. They were made in or near the College Grounds, Toronto. Any person addicted to out of door pursuits, can follow up the subject with little trouble: it would be difficult to name one of which the interest grows more upon the observer; or which, when full data have been collected, will throw more valuable light upon many points of climate and meteorology. It should be remarked that differences of soil and

position, frequently cause two, three, or even more days difference, between the epochs of the same event in trees or plants of the same species, very near one another. It will generally be found that these differences are constant. An early and a late specimen should be selected. There is also a considerable interval between the opening of the first flowers on shrubs—like the Lilac, Almond, &c.,—and any general display of blossom—both periods should be observed. It should be added, when the flowering is completely over. Again, it is not altogether easy to decide, exactly, when leaves are to be considered fully expanded: the observer should note the date at which it can be first asserted doubtfully, and when it is past a doubt. Remarking also the condition of the weather, which may be supposed to hasten or retard the phenomena. Such as a prevalence of fine or cold days, about the time each is expected—warm or cold rains—high winds, and so on. Lastly, no observer can be certain that his observation is the first that might have been made in the neighbourhood, and a considerable number of independent records must be consulted to fix the epochs exactly.

	In Flower.		
	1850.	1851.	1852.
Phlox Setecea		May 7	Ap'l 28
Hepatica triloba		"	May 29
Flowering Almond, first flowers	May 26	May 22	June 3
" fully covered	June 4	May 26	" 18
Flowering over	"	"	May 27
Lilac, Common, first flowers	"	May 27	June 3
" fully covered	June 6	June 3	" 18
" flowering over	"	"	May 8
Rock Maple	"	Ap'l 28	" 8
First Dandelion	"	"	May 26
Horse Chesnut, first flowers	"	May 23	June 2
" fully covered	"	May 28	"
" flowering over	"	June 21	May 21
Indian pear, Poire		May 11	
Syringa		June 17	June 22
Common Honeysuckle, first flowers		June 5	June 13
" fully covered		June 20	"
Red Trumpet Honeysuckle		"	June 18
Common Red Peony		June 5	June 11
Acacia (Locust)		June 23	
Persian Lilac		June 17	June 12
Guelder Rose		May 26	June 2
Canadian Thorn			June 12
Mountain Ash			
Shadbush			May 25
Apple		May 25	May 27
Cherry		May 18	May 20
Plum		May 18	
Birch			
Beech		May 18	
Larch			
Elm			June 18
Strawberries, first ripe		June 15	
Scarlet Tanager seen		May 13	
Pigeons in passage		May 18	
Black Plover		May 24	
Wax-wing seen			June 5
Fire-flies seen		June 15	June 7
Humming Birds seen			May 27

Errata.—In the March number of this Journal several articles, thro' an accidental misunderstanding, were sent to press without having been corrected. Subjoined is a list of the most important corrections which should have been made.—Pages 183—184:—

Fraxinus Sambricifolia,	read	Fraxinus Sambucifolia.
Ribes Cynorbati,	"	Ribes Cynosbati.
Thalictrum Divicum,	"	Thalictrum Dioicum.
Actœa Alba,	"	Actæa Alba.
Cratœgus Coccinca,	"	Cratægus Coccinea.
Impatiens Fulca,	"	Impatiens Fulva.
Rhus Torricodendon,	"	Rhus Toxicodendron.
Supinus Perennis,	"	Lupinus Perennis.
Fiarella Cordifalia,	"	Tiarella Cordifolia.
Astir,	"	Aster.
Tricutalis Americana,	"	Trientalis Americana.
Gerardia Guercifolia,	"	Gerardia Quercifolia.
Scuetllaria Gelericulata,	"	Scutellaria Galericulata.
" Parvula,	"	" Parvula.
Gentiana Ptheumonanni,	"	Gentiana Pneumonanthe.
Phytolacca Decanda,	"	Phytolacca Decandra—Pokeweed.
Cypropedium Spectabile,	"	Cypripedium Spectabile.
Noularia Perfoliata,	"	Uvularia Perfoliata.
Veronica Beccabunza,	"	" Beccabunga.
Lithospernum Canesceus,	"	" Canescens.
Abile,	"	Abele.
Dandylion,	"	Dandelion.
Parslane,	"	Purslane.
Supine,	"	Lupine.
Mullen,	"	Mullein.

Page 186—Line 29 for 6 sec., read 6 min.

INCORPORATED BY ROYAL CHARTER.

Canadian Institute.

FIFTEENTH ORDINARY MEETING.

ANNUAL CONVERSAZIONÈ.

The very gratifying nature of the proceedings at the Annual Conversazionè of the Institute, held in the Hall of the Legislative Assembly, on Saturday, April 2nd, induces us to adopt a method of recording them, which savours less of originality than of respectful submission to the opinions of the Press, as shown in the very flattering descriptions which we beg leave to subjoin:

(*From the North American.*)

"On Saturday evening the most interesting, Literary, Scientific, and Pleasurable meeting ever witnessed in Toronto, was held in the Legislative Assembly Hall.—It was the Annual Conversazione of the Canadian Institute, and some 300 gentlemen, including all the friends of Literature and Science in the City—from the Bishop downwards—graced the very pleasing scene. The Council of the Institute had made great preparations to render oblivious all previous similar efforts. The Hall was tastefully

decorated with Science, Literature, and Art; cases of stuffed birds, cases of insects, and insect architecture, models of machines of various kinds, paintings, engravings, scientific instruments, &c, &c., embellished the Hall. The fine painting of the Queen by Berthon, was suspended above the Chair, and to the right was an excellent portrait, and striking likeness of Capt. Lefroy, President of the Institute, taken by the Council as a memorial of his able services. The Lobby of the House was used, for the nonce, as a refreshment room."

(From the Colonist.)

"On Saturday evening, the 2nd instant, this Society entertained a large number of their fellow-citizens, in the Hall of the Legislative Assembly, which was suitably prepared for the purpose. On the dais, and grouped around the President's Chair, were numerous instruments, as Telescopes, Theodolites, Levels, and the like. Immediately in front was a very beautiful model of Jerusalem, mounted on an elegant iron pedestal. In the centre, and around the sides of the room, seats were arranged, divided by long tables laden with objects of vertu, statuary, and carving in figures, vases, &c., &c. Amongst them we observed one of the late Duke of Wellington, Paul and Virginia, the Dying Gladiator, and other examples of Copeland and Minton's beautiful statuettes, and a large collection of Minton's Gothic tiles and porcelain ware. There were some good bronzes, and a number of elegantly designed and well executed bread platters, in the olden style. Several books containing a large collection of medallions after the antique, and some excellent specimens of Daguerreotypes on glass, attracted much notice, as did two excellent models of new steamers for our Lake, especially that of the *Peerless.* Cases of birds occupied the piers between the windows, and at one end of the room were arranged various parts of the locomotive engine, as tubing, springs, steam guages, safety valves, &c., exhibited by Mr. Good. The tables were spread with illustrated books of elegant character connected with the arts and sciences, comprising Portraiture, Sculpture, Architectural Decoration, Engineering, &c., &c.

"At eight o'clock, nearly 300 gentlemen had assembled, among whom we observed the Bishop of Toronto, the Chief Justice, Mr. Justice Draper, Vice-Chancellor Spragge, Dr. McCaul, Dr. Beaven, Dr. Ryerson, Dr. Cronyn, of London, many Members of the Corporation, the Professors of both Universities, and, indeed, a representation of all the public bodies in the City. After having partaken of the hospitality of the Society, the meeting was called to order by the President, Captain Lefroy, R.A., F.R.S. He expressed the pleasure which the Society had in receiving their fellow-citizens on these annual occasions,—referred to the progress which the Society had made during the past year,—alluded to the valuable papers which had been communicated at the weekly meetings of the session now closing,—and enlarged upon the advantages resulting from such Societies as these, not only in direct relation to the cultivation of Science and the Arts, as affording opportunity for closer communication between scientific and professional men; but in a social view, as an agreeable and profitable link uniting those who, although engaged in widely different paths of business, possess congenial tastes and aspirations. He made a graceful and feeling allusion to the portrait of himself which the Society had secured in anticipation of his departure, and expressed a confident belief that the Institute possessed elements guaranteeing its permanent stability and success.

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"We are unwilling to adopt the stereotyped phraseology of commendation in regard to this meeting, nor would it be appropriate. We have no recollection of any occasion when the happy blending of the hospitable, the entertaining and the instructive, gave such unquestionable gratification, and although, as Professor Cherriman observed, being the last occasion of the presence of the President at the Institute, the feelings of the members generally were tinged with regret, yet the proceedings were of so interesting a character that even this failed to mar them."

(From the British Canadian.)

"The Canadian Institute.—It is not often it has fallen to our lot to chronicle such an intellectual treat as we partook of on Saturday evening last, when the annual Soiree of the Canadian Institute took place at the Parliament Buildings, in the Hall of the Legislative Assembly. It was the largest, the most influential, and the most interesting of the meetings of this rising Society which has yet taken place. There could not have been less than two hundred gentlemen present when the chair was taken by the President of the Society, Captain Lefroy, who in his usual happy manner opened and gave an impetus to the proceedings by calling on the Hon. Justice Draper, who delivered an interesting sketch of the rise and progress of Upper Canada since 1775, to the present time. Rev. Professor Irving next ascended the dais, from which he delivered a lecture explanatory of the modern invention of the Stereoscope, and explained the optical delusion by which the magical effects of this new discovery are produced. He was followed by Dr. Hodder who read an interesting paper on the poisonous plants which are found in the country adjacent to Toronto, which was listened to with much attention.

"A short recess took place for Refreshments, tea and coffee being served in the Hall, after which the President having resumed the chair;

Professor Cherriman, the Vice-President of the Society came forward and laid on the table a very beautiful silver vase, which the members of the Institute desired through him to present to Captain Lefroy, on the occasion of his now farewell to the Society, previous to his departure for England. Mr. Cherriman alluded to the rapid progress of the Society under him, which from 70 or 80 members last year, had now increased to near 300, and was rapidly rising in character also. He alluded in happy terms to the services of Capt. Lefroy, and concluded by presenting the address and piece of plate to that gentleman, who replied in suitable terms, and evidently under feelings of strong emotion.

"The Rev. Dr. Scadding next read a most interesting paper on a most popular subject, "Accidental Discoveries," which afforded much gratification. T. Henning, Esq., next delivered an animated and most interesting address on the probabilities of Sir J. Franklin and party being yet discovered, and the course he was likely to have pursued in opposition to that first laid down for him. This being ended, F. Cumberland, Esq., moved Dr. McCaul to the chair, and he having assumed the same, a vote of thanks to Capt. Lefroy was moved and carried by acclamation, and after a brief address from Dr. McCaul, the proceedings closed.

(From the United Empire.)

"The annual Soiree of this Institution was held on Saturday evening last, at the Hall of the Legislative Assembly in the Parliament Buildings, and truly a better use the room could not have been put to. The President, Capt. Lefroy, R.A., presided; and the most pleasing part of the evening's proceedings, consisted in the presentation of a handsome piece of plate to that gentleman, as a well-deserved testimonial of the high opinion entertained by the members of his services, and very appropriately presented on the occasion of his approaching departure for England.

"The room was well filled by our most distinguished Toronto savans and other visitors; and was ornamented with a large collection of objects of interest, in the shape of casts, medals, natural curiosities, engravings, with the refreshing addition of some shrubs and flowers."

(From the Globe.)

"The Canadian Institute gave their annual *Conversazioné*, at the close of the season, on Saturday evening last. The Legislative Assembly Chamber was very handsomely decorated on the occasion. The walls were hung with paintings and engravings; stands covered with flowers from the conservatories of Mr. Fleming, occupied conspicuous places, and long tables were used for the display of models of machinery, books of fine plates, pieces of statuary, and other objects of interest. The paintings of Venetian scenes, said to be by Canaletti, and possessing most of the excellencies of that master, excited the most attention. They are the property, we understand, of Kenneth Cameron, Esquire. Conspicuous, beside the platform, on an easel, stood the portrait of Captain Lefroy, the President of the Institute, painted by Mr. Berthon, and intended to be hung in their place of meeting. Tea and coffee were served in the main hall of the building. About half-past eight, the gentlemen assembled were called to order by the Chairman, Captain Lefroy, who welcomed them in the name of the Society."

During the evening the following address to Captain Lefroy, was read by Professor Cherriman, First Vice-President, on the part of the members of the Institute. Professor Cherriman introduced the subject of the address in very feeling and appropriate terms:

TO CAPTAIN LEFROY, R. A., F. R. S., PRESIDENT OF THE CANADIAN INSTITUTE.

Canadian Institute,
Toronto, April 2nd, 1853.

Dear Sir,—This being the last occasion on which the members of the Institute may hope to have the honour of your company and presidency, we cannot let it pass without some attempt to express to you our earnest thanks for the services you have rendered the Institute, and our great regret that the call of duty should summon you away from us.

We feel Sir, that not only the Institute, but the Province itself, owes you a heavy debt of gratitude, and in your departure will sustain a loss not easily to be repaired.

The zeal and ability with which you have discharged the difficult and laborious duties that devolved on you, in carrying out the system of Magnetical Observation established by the liberality of the Imperial Government; the investigations of magnetical and meteorological phenomena, with which your name is inseparably associated; and the various scientific memoirs that proceeded from your pen during this period, have not only been of incalculable service in promoting the interests of Science in the Province, but have also caused the name of Canada, and of Toronto in particular, to be honoured in all parts of the world where science is cultivated.

We must not forget also that to you is mainly due the rise and progress of this, the only active scientific Society in Upper Canada,—a result brought about not only by your own exertions and example, but also by that unfailing courtesy and kindliness which has always marked your intercourse with us, and which has inspired us all with the strongest feelings of esteem, and permit us to say, of affection towards you.

We thank you, Sir, for having acceded to our request, that we might be permitted to retain a memorial of yourself, in the form of your portrait, which will always serve to remind the Society of how much it owes you, and will be treasured by it as a choice heirloom.

We now beg of you to accept the accompanying piece of plate, as a slight token of our esteem and gratitude, receiving with it an earnest assurance, that much as we deplore your departure, our best wishes for your happiness and welfare go with you. Signed on behalf of the Institute.

J. B. CHERRIMAN,
FRED. CUMBERLAND,
Vice-Presidents.

Sixteenth Ordinary Meeting, April 9th.

The following gentlemen were duly elected members of the Institute:—

T. D. Harris,	Toronto.
John Worthington,	"
E. C. Campbell	Niagara.
C. S. Gzowski,	Toronto.
J. G. Joseph,	"
D. K. Feehan,	"
G. W. Strathy,	"
E. F. Whittemore,	"
W. H. Weller,	"
G. B. Wyllie,	"
Thos. Hodgins,	"
J. D. Phillips, H. Davis, } Junior Members,	"
Hon. J. G. Spragge,	"
J. L. Robinson,	"
Thomas Wheeler,	"
E. D. Palmer,	"
E. W. Beaven,	"
A. Crooks,	"
E. H. Rutherford,	"
R. M. Wells,	"

The Hon. P. B. DeBlaquiere was duly proposed a member of the Institute.

The following resolution was carried unanimously:—

That the cordial thanks of the Institute be tendered to those gentlemen who assisted, by their contributions, in decorating the Hall of the Legislative Assembly at the late Conversazionè.

It was also resolved, That it be an instruction to the Council to make arrangements for opening the Rooms of the Institute, at least once a week, to the members, until the commencement of the next Session.

It was then announced by Professor Cherriman, first Vice-President, that the Session of the Institute was now terminated; and that the First Ordinary Meeting of the next Session would take place in December, of which due notice will be given in the Canadian Journal.

On the Poisonous Plants which are indigenous to, or which have become naturalized, in the neighborhood of Toronto, by Edward M. Hodder, M.C., & M.R.C.S. Professor of Obstetrics &c., in the University of Trinity College.

In the course of time many wise theories have been held current in physic, and many vain promises made by the empirical, yet I am not acquainted with any apothegm half so wise as that which is condensed by Dr. Cullen, into two lines of small pica, and which are as follows:—

'I have cured weak stomachs by engaging the persons in the study of botany, and particularly in the investigation of native plants.'

This then, being a sovereign panacea for the cure of many of the ills which flesh is heir to in this thriving city, I hope I shall be excused for calling the attention of this meeting to a short

(and I fear a very imperfect) history of the poisonous plants which are either indigenous to, or which have become naturalized in the immediate neighbourhood of Toronto.

The district, whose poisonous vegetable productions I propose to examine is very limited, being bounded by the river Don on the east, the Humber on the west, and extends north about four or five miles, while on the south it is washed by the Lake.

Contracted as the area is, it is remarkable for the variety of its soil, from the most stubborn and tenacious clay, to the lightest and most barren sand; yet, it is not distinguished for any peculiarity in its stratification.

It is of importance to remark the geological relations of plants, particularly in a new country, because it throws some light on the laws of vegetable distribution. It suggests the questions whether it be indigenous and coeval with the soil; or if introduced, by what means has that been effected.

Whether arts or commerce, agriculture or manufactures, superstition or medicine, has brought it; or, which is frequently the case, whether the altered state of the earth's surface has not afforded to nature, by her ordinary laws, increased means of diffusion.

We are told that in the days of Gesner, the Fumaria Officinalis, or Fumatory was a very rare plant in the fields of southern Europe, and was supposed to have come from the east; now, it is the commonest weed in corn fields and gardens from Greece to Lapland.

When I first came to Canada in 1834, many of the plants which are now most common were then never seen, in proof of which I may instance, the Agrostemma or Corn Cockle, the Senecio Vulgaris or Groundsel, the pretty little Pimpernel, and the Fumatory. It is remarkable that the Anthemis Cotula (stinking May weed) which in this neighbourhood renders all our road sides white with its blossoms during the greater part of the summer, should not be found fifty miles to the north of Toronto.

Having made these preliminary observations, I shall now commence this grave subject by a description of the most poisonous plants, after which I shall speak of those which are simply acid in their recent state, but, I greatly fear that I shall not be able to relieve its technical dulness by any little excursions into the by paths of literature, or by its useful application to science —you must be prepared, therefore, Mr. President, to find it as dry and uninteresting as a spelling book, or as that engaging and entertaining work Dr. Johnson's Dictionary.

1st. The Datura Stramonium—Thorn Apple—also known under the names of The Devil's Apple, Apple of Peru, and Jamestown Weed. It belongs to the Linnæan class, and order Pentandria—Monogynia, and Natural Family Solanacea.

It is found in various parts of Europe, Asia, and America, growing in gardens on rubbish heaps, and road sides.

The Thorn Apple is an annual, growing to the height of from three to five feet, according to the richness of the soil; it has a leafy, branchy stem, of a purple colour, with green spots; the leaves are large, ovate, sinuous, and deeply cut; the flowers, which make their appearance in August and September, are axillary, long, trumpet-shaped, white, pale purple, or blue, and are followed by a capsule the size of a large walnut, covered with long sharp prickles, four-celled, and filled with blackish, rough kidney-shaped seeds. The whole plant when recent, has a strong nauseous and disagreeable odour, which, when powerful, is stated by Beck to be 'certainly noxious.' All the domestic animals refuse it as food.

It is a powerful narcotic poison, and used as such in the East for nefarious purposes, and in Russia for increasing the intoxicating effects of beer. Medicinally, the Thorn Apple has been found efficacious in asthma, and organic diseases of the heart, when its fumes have been inhaled by smoking.

It is not, however, for its medicinal, but for its poisonous properties, that I wish to direct your attention to it; and, having witnessed these effects in several instances, I can speak of them from personal observation.

Being an early plant, it is occasionally gathered when young in mistake for Lamb's Quarter, (Epilobium?) boiled, and eaten as greens—the effects in many instances being followed by serious consequences.

At first it produces dryness of the mouth and throat, speedily followed by nausea, delirium, loss of sense, a sort of madness or fury, loss of memory—sometimes transitory, and sometimes permanent—convulsions, paralysis of the limbs, excessive thirst, dilatation of the pupils, tremblings, and death.

The severity of the symptoms depend greatly upon the peculiar constitution and age of the person; children, two or three years old, have died in two hours from eating some of the seeds, whereas adults who have partaken freely of it, have recovered after a time, and without any permanent ill effects being produced.

A family whom I attended some years ago, were all attacked in the manner above described; the children vomited before I reached the house, and speedily recovered; but the father and mother, who had partaken more freely of it, continued ill for many days, ultimately recovering, but with permanent paralysis of the extensor muscles of the feet.

In Beverley's History of Virginia, we find the following curious account of its effects:—'The Jamestown Weed, which resembles the Thorny Apple of Peru, is supposed to be one of the greatest coolers in the world. This being an early plant, was gathered very young for a boiled sallad, by some of the soldiers sent thither to quell the rebellion of Bacon; and some of them eat plentifully of it, the effect of which was a very pleasing comedy, for they turned natural fools upon it for several days. One would blow up a feather in the air; another would dart straws at it with much fury; another, stark naked, was sitting up in a corner like a monkey, grinning and making mows at them; a fourth would fondly kiss and paw his companions, and sneer in their faces with a countenance more antic than any in a Dutch droll. In this frantic condition they were confined, lest, in their folly, they should destroy themselves. A thousand simple tricks they played, and after eleven days returned to themselves again, not remembering anything that had passed.'

Numerous cases in which death has taken place after eating this plant, might also be cited.

2nd. Rhus Toxicodendron or Radicans—The Poison Ivy. This plant is very common in Canada and the United States, growing on the borders of woods, in the angles of fences, and road sides; flowering in June and July, and belongs to the Class Pentandria, Order Trigynia, and to the Nat. Family Terebinthaceæ of Decandolle.

The root is generally trailing along the ground, sending up many stems, but when it meets with support, such as a tree or a wall, it will climb like ivy to a considerable height.

The leaves are alternate, supported on long petioles; the leaflets ternate, rhomboidal, acute, smooth and shining; the veins on the under surface, slightly hairy. The flowers are small, greenish white, in panicles which are chiefly axillary. The berries are roundish, of a pale green color, approaching to white.

The fresh juice of this plant is powerfully irritant, producing violent itching, redness, and great tumefaction of the affected parts, particularly the face and those portions of the body where the skin is most delicate.

This swelling is followed by vessications, heat, pain, and symptomatic fever, which continues for two, three, or four days,—the symptoms then subside, the blistered parts being covered with a crust.

These effects usually make their appearance in four or five hours, and though very distressing, are rarely fatal.

The treatment required is strictly antiphlogiotic—viz., rest, low diet, aperients, with cold applications, such as the sugar of lead wash, &c.

It is, however, only in certain constitutions, that these phenomena are produced, for in the majority, I believe, it exerts no influence whatever; the leaves having been rubbed, chewed, and swallowed without injury.

The poisonous property resides in a yellowish milky juice, which exudes from the wounded extremities of the plant, and when applied to linen, forms an indelible black stain, which neither washing nor chemical agents will remove. (Here the lecturer illustrated the effects by reference to several cases.)

3rd. Rhus Vernix.—Poison Sumach. This plant belongs to the same family, and produces, when applied to the skin, the same symptoms as those which I have just described.

It is even said that, in susceptible constitutions, the near ap proach to this tree is sufficient to produce its effects.

4th and 5th. Cicuta Maculata—American Hemlock. Cicuta Bulbifera—Bulbiferous Cinta.

6th. Œthusa Cynapium—Fools Parsley.

These three plants nearly resemble one another; they belong to the Class Pentandria, Order Digynia, and the Nat. Family Umbellatæ, and are to be found in wet meadows, ditches and ponds.

The root of the Cicuta Maculata is composed of a number of large oblong, fleshy tubers, diverging from the base of the stem, and frequently being found of the size and length of a finger. The root is perennial, and has a strong, penetrating smell and taste. In various parts of the bark it contains distinct cells or cavities, which are filled with a yellowish resinous juice.

The plant is from 3 to 6 feet high. Its stem is smooth, branched at top, hollow, jointed, striated, and commonly of a purple colour, except when the plant grows in the shade, in which case it is green. The leaves are compound, the leaflets oblong, or cuminate, sinuate. The flowers grow in umbels, are white, consisting of 5 petals, which are obovate, with inflected points.

These plants, like their congeners of Europe, the Conium Maculatum and Cicuta Virosa, are violent poisons, and they all produce nearly the same train of symptoms—viz., vertigo, obscurity of vision, pain in the head, vacillating walk, dryness of the throat, ardent thirst, vomiting of greenish matter, irregular respiration, coldness of the extremities, lethargy or delirium, epilepsy, especially in children, which frequently terminates in death.

The Cicuta Virosa of Europe is stated by Dr. Churchill to be by far the most poisonous plant of Great Britain; and Doctor Bigelow, (of Boston,) in speaking of the Cicuta Maculata, says, 'This is probably the most dangerous of all our poisonous vegetables, and various instances of speedy death have taken place in children who have unwarily eaten the root.'

For particulars see Vol. I., American Medical Botany.

7th, 8th, 9th & 10th. Euphorbia Helioscopia—Sun Spurge.
" Polygonifolia—Knot-grass Spurge.
" Maculata—Spotted Spurge.
" Hypericifolia—Oval-leaved Spurge.

The numerous species of Euphorbia which are found in various parts of the world, are all eminently acrid, and belong to the class Dodecandria, Order Trigynia, and Natural Family Euphorbia.

The species above enumerated are amongst our commonest weeds in cultivated grounds, road sides, and on the sand at the Island. In their action they are powerfully irritant, and all the effects on the body are subordinate to that action.

The milky juice which exudes when any part of the plant is broken, produces, in children, when applied to the skin, an eruption of vesicles, containing at first transparent lymph, which afterwards becomes opaque, and ultimately forms a dry crust or scab.

I have often been sent for to see children who had been playing with this common weed, and whose anxious mothers imagined were labouring under chicken pock; and so nearly do the two states appear, that I have been in doubt for a time whether to ascribe it to the poison or the disease.

In any of the cases which I have seen, there has not been any symptomatic fever, nor has the eruption appeared on any part of the body usually covered by clothes—but on the hands and arms, face and neck, or legs.

I am not aware of any ill effects having followed the handling of these native plants; but the East and West Indian, and African varieties produce violent inflammation, and even ulceration of the skin, or any part of the body with which it comes in contact.

11th. Arum Triphyllum----Dragon Root or Indian Turnip. This singular and elegant plant is a native of our swamps and wet woods.

The root is round and flattened, its upper part tunicated like an onion, its lower and larger portion tuberous and fleshy, giving off numerous long white radicals in a circle from its upper edge. On the under side it is covered with a dark, loose, and wrinkled skin.

The leaves are on long footstalks, and composed of three oval acuminate leaflets.

The flower is a large, ovate, acuminate spathe, convoluted into a tube at the bottom, but flattened and bent over at the top like a hood. Its colour is various; in some it is green, in others dark purple, or almost black, mostly variegated, with pale greenish stripes on a dark ground.

It belongs to the class Monœcia, Order Polyandria. Every part of the arum, and especially the root, is violently acrid, and almost caustic; applied to the tongue, or to any secreting surface, it produces an effect like Cayenne Pepper, but far more powerful, so much so, as to leave a permanent soreness of many hours' continuance.

This acrimony is of a volatile nature, and disappears upon boiling or drying.

It consists of an inflammable substance, volatile at low temperatures, and not combining with water or alcohol.

12th. Calla Palustris------------Northern Calla.

This handsome aquatic plant belongs to the same class and order as the foregoing, and is found in the swamps near the Humber.

The root is as large as the finger, jointed, and creeping. The leaves are smooth, entire, heart-shaped, with an involute point.

The flower or spathe, oval, sprea ling, recurved, clasping at the base, and ending in a cylindrical point.

The root is acrid, like that of the arum, but the pungency disappears in drying. Linnæus says the Laplanders use it for bread.

13th. Anemone Nemorosa................Wood Anemone.

14th. Ranunculus of different species. } Crowfoot, Buttercups.

These well-known plants are amongst the earliest flowers of Spring, and are too common in all our meadows, pastures and woods, to require a particular description.

They are all more or less acrimonious, but like the arum and the calla, this property is lost by drying.*

15th. Sanguinaria Canadensis....Blood Root.
Class Polyandria..........Order Monugyina.

This is one of our earliest spring flowers. The flower and leaf proceed from the end of a horizontal, fleshy, abrupt root, fed by numerous radicles.

Externally, the colour of the root is a brownish red; internally, it is pale, and when divided, emits a bright orange-coloured juice from numerous points of its surface.

The bud or hybernaculum, which terminates the root, is composed of successive scales or sheaths, the last of which acquires a considerable size as the plant springs up.

By dissecting this hybernaculum in the summer or autumn, we may discover the embryo leaf and flower of the succeeding spring, with a common magnifier, and even the stamens may be counted.

The leaves are heart-shaped, with large roundish lobes, separated by obtuse sinuses. The flower consists of eight white spreading, and concave petals.

The root is violently emetic.

16th. Phytolacca Decandria..................Poke.
Class X...........Order X.

This is a common plant found on the road sides, and flowering in July and August. The flowers are succeeded by long clusters of dark purple berries, almost black, with which the Indians stain their basket work, and hair for embroidery.

The root is violently emetic.

(To be continued.)

* The greater part of the plants of this order are objects of interest with gardeners, containing, as it does, many of the most elegant or showy of the tribes of hardy plants. It is here that the graceful Clematis, the lowly Anemone, the glittering Ranunculus, and the gaudy Pæony are found, differing indeed, in external appearance, but combined by all the essential characters of the fructification. It is remarkable, however, that the acrid and venomous properties of these plants are nearly as powerful as their beauty is great. They are all caustic, and in many of them the deleterious principle is in most dangerous abundance.

Mons. Decandolle remarks that its nature is extremely singular; it is so volatile that, in most cases, simple drying in the air, or infusion in water is sufficient to destroy it; it is neither acrid nor alkaline, but its activity is increased by acids, honey, sugar, wine or alcohol; and, it is in reality, destructible by water. The Crowfoots of our pastures, and the Anemone Trilobata and Triternata of South America, are well known poisons of cattle. Blistering plasters are made in Iceland of the leaves of the Ranunculus Acris.

The Helleborus, famous in classical history for its drastic powers, and the Nigella, celebrated in ancient housewifery for its aromatic seeds, which were used for pepper before that article was discovered, are both comprehended in the Ranunculaceæ.

The range of this order, in a geographical point of view, is very extensive. A very great number has been discovered in Europe; but they are so abundant in all parts of the world, that an order can scarcely be found more universally and equally dispersed.

On Accidental Discoveries.

Read at the Annual Conversazione of the Canadian Institute, April, 2, 1852, by Henry Scadding, D.D., Cantab., *First Classical Master of Upper Canada College.*

I shall ask you to transport yourselves in imagination, for a few moments, to the sea-side. The brilliant blue of the heavens—the stillness, and rather inconvenient glare of light on the surface of the water, may tell you that it is the Mediterranean. The arid aspect of the precipitous shore, with the dark palm-trees that stand out distinctly here and there along the strand, indicate that it is the Syrian coast. Yonder bold promontory on the right is the famous Cape Carmel. The spacious bay which you gaze into is the Bay of Acre. The river which you see entering between the ridge of low rocks and the beach of white sand on the left, is the Belus. To that beach of white sand let me direct your attention. A group of sea-faring men are there rising from their mid-day repast; their vessel—a small trading craft—has been run in close to the shore; their meal and siesta over, they are gathering up their rude culinary utensils, and are about to resume their voyage. The fire upon the beach has smouldered away; the pale ashes have become of the same temperature as the surrounding sand.

But while the party are busy in re-embarking, one—he is possibly the commander of the vessel—observes something in those ashes. Something that glistens strikes his eye; he touches it with his knife; he lifts it out from among the mingled ashes and sand, a bright, irregularly-shaped mass. Something has been fused in that fire; whilst fluid it has "run," as we say, in several directions; where, in one place, it has met with the rock underneath, it has spread out in small sheets, which are, to some extent, transparent.

Now, it will be necessary to explain. Yonder vessel bears in its hold, among other merchandize, some tons of rough nitre—a substance produced naturally in the neighbourhood of the Dead Sea. It was used possibly of old, as now, in the preservation of fish and meats. The sailors, on landing, having failed to find near at hand stones adapted for the purpose, took some lumps of this portion of their cargo to rest their camp-kettle upon. The fire has acted on those lumps, as also on the silicious sand on which they are placed; fusion and amalgamation of the two substances have ensued; the hard transparent material, noticed by the commander of the vessel, is the result. The captain, during the remainder of the voyage, is more silent than usual; he is ruminating on what he has observed—"If this nitre and this sand, thus subjected to fire, will produce this hard, transparent substance once, they will do so again; if this substance spread itself out so readily upon the flat rock, becoming solid and continuing transparent, it will spread more conveniently, and be rendered more transparent by means of surfaces which I can prepare for its reception—nay, will it not assume any form of which I may be able to construct the mould?"

You will perceive that it is *glass* that has been discovered—a substance that contributes so much to the comfort and gratification of man—a substance that excludes from his house the inclemencies of the atmosphere, and yet admits freely the sun's rays; that adorns his hospitable board with a variety of vessels of brilliant hue and graceful shape—that permits him to refresh his eyes in winter with the green leaves and blooms of summer—that helps to repair his vision when defective, and to add incredible powers to it when at its best—a substance that, elaborated into massive plates, lends lustre along the street to his multifarious handywork; and, on occasion, forms walls of what, prior to experience, would be deemed of fabulous extent, to shelter in vast store-houses the gathered masterpieces of his skill.

The narrative just given may or may not be authentic. Pliny

met with some such story, and thought it interesting enough to be treasured up in that curious depôt of fact and fancy—his "Natural History." I simply use it as an illustrative introduction to some examples of accidental discovery in Science and the Arts, which I have thought it might not be inappropriate to enumerate to you this evening.

That glass was in some manner discovered at an early period of the world's history, is certain. Articles of this material, very skilfully constructed, have been found in the palaces of Nineveh, and the ancient tombs of Egypt and Italy. The number of glass vessels to be seen in the great Museum at Naples, collected from the buried cities of Herculaneum and Pompeii, is truly astonishing. In that Museum are also preserved numerous fragments of *flat* glass from the latter place, together with bronze lattice-work with panes of glass actually inserted, proving that glazed windows were by no means unknown eighteen centuries ago.

Could we be admitted to the secret history of discoveries and inventions in general, I dare say we should find that many more have originated in what was apparently an accident, than we are now aware of. We know that the devotees of the so-called Occult Sciences in the Mediæval period—the Alchemists—the transmuters of metals and searchers after the elixir of life—lighted on facts that tended largely to the development of the real science of Chemistry.

We have dim traditions from the mythological times of the accidental invention of musical instruments. The wind whistles over the sheaf of broken reeds in the arms of the shepherd-god, and gives him the idea of the syrinx—the pipes of Pan—the embryo that grows at length into the noblest perhaps of all musical instruments—the Church Organ. Again, Hermes strikes his foot against the shell of the sun-dried tortoise, and the tightly-strained tendons give out musical tones. He thus literally stumbles on the lyre—the germ of our harp and piano-forte. The colossal statue of Memnon (Amenophis) in Egypt, emits music from its head—cavities in the sculpture producing vibrations in the air. The fact is converted into a miracle, and gives birth to a series of adroit uses of the simple laws of nature for the creation of surprise in the minds of the ignorant.

Were we living in an age of infantile simplicity, to what myths might we not expect those mystic chords to give rise which in these days are so rapidly encircling the earth as with a zone! Listen to the excellent music which they discourse over your heads as you walk abroad! We overlook the phenomenon as a mere trifle—the principle of which, however, might lead us at least to the Æolian Harp—were we not long forestalled in that; and are absorbed—and justly so—in the sublimer contemplation of a system of artificial nerves, gradually throwing themselves out over the globe, along which may rush impulses from the will and soul of man.

Of chance discoveries hinted at in very ancient history, I find one or two cases more. The gracefully-curling leaves of an Acanthus plant, surrounding a basket left by accident upon it, catch the eye of a sculptor who has a quick sense of the beautiful. A new style of ornament for the column is instantly conceived. The Corinthian capital thenceforward in all after ages gives pleasure to the frequenters of Temple and Forum. Again, the hand of affection, on one occasion, is prompted to delineate on a wall the shadow of a head, to be a memento, during an anticipated absence, of the beloved reality. The art of portrait-painting takes its rise from the circumstance.

The popular tradition is that the falling of an apple first suggested to Newton the idea of universal gravitation. Sir David Brewster, very reasonably, gives no credence to the story. Still, we can well imagine the philosopher in his orchard at Woolstrope, using such a casual occurrence by way of illustration to a friend:—"If this earth be a globe, and what is "up" to us is "down" to our antipodes, why does yonder apple, for example, descend to the surface in preference to rising outwards into space?" And may we not ask, in connection with Newton, is it not exceedingly likely that the resolution of white light into its component parts by the prism, may have been suggested to him by the beautiful colours which he must often have seen projected on the walls and ceiling of a room from the crystal drops of a chandelier? But questions like this it is easy to put, in the case of almost every invention, after it has taken place. We are so fortunate as to be put at once in possession of the result, without being obliged so much as to think of the steps which led to it. Still, it is interesting sometimes to conjecture what those steps were.

The bold stroke of Columbus, by which he caused the egg to stand alone, has become a proverb. Any person visiting now the heights behind Genoa, and remembering that the great navigator was once familiar with that scene, can imagine it to be exceedingly natural that he should have discovered America. "If Africa lies yonder, though invisible to the eye, what reason is there, why I should not believe, when I look out on the Atlantic from behind Lisbon, for example, that there is as certainly land to be arrived at, by persevering to the West?"

By a pleasant train of association, the mention of Genoa and Columbus suggests to me the memory of Pisa and Galileo—with another example of happy accidental discovery. It was in the magnificent cathedral at Pisa that the gentle oscillations of a chandelier gave Galileo (1642) the idea of the application of the pendulum, as a regulator in an apparatus for the measurement of time—a combination that ripened at last into that exquisite piece of mechanism—the Astronomical Clock.

The recent ingenious experiment of M. Foucault, to demonstrate to the eye the motion of the earth, was the result of a chance observation. While engaged about a turning-lathe, he took notice that a certain slip of metal, when set in motion, vibrated in a plane of its own, independently of the movement of the part of the lathe on which it was carried round. Hence, he thought he could by a certain contrivance exhibit to the eye the revolution of the earth on its axis. He obtains permission to suspend from the dome of the Pantheon at Paris, a pendulum of some 280 feet in length, and demonstrates the accuracy of the idea which he had conceived. However difficult of brief explanation the phenomenon may be, it is nevertheless a fact—and it is with a degree of awe that one witnesses it—that the pavement of the Church seems very sensibly to rotate, the pendulum at every oscillation returning to a different point on the graduated circle placed below the dome.

The inventor of spectacles was a great benefactor—but having found no chronicler, his name is lost. He was, probably, some one who himself suffered from defective vision—the necessity of an individual often leading to contrivances which benefit a class. Friar Bacon has been mentioned as the inventor, but not with certainty. Spectacles, however, became generally known in Europe about his time (1214—1292). I have often thought that a person afflicted with short sight, would be very apt to hit upon a remedy. I remember, as a boy, discovering that many of the little blisters in common window glass would partially correct short-sight; also, that the polished bottom of a common tumbler would occasionally do the same—facts that might lead any one to the construction of concave lenses.

(To be continued.)

REVIEWS.

Lake's System of Canal Steam Navigation.

It is a somewhat strange coincidence that whilst reviewing a proposition for a Ship Canal on this side of the Atlantic, of 20 feet depth of water, (See March No. of Canadian Journal,) to supersede a river depth of 8 feet, our notice should be attracted to a system patented in England and proposing to apply steam power to the economic and efficient use of shallow Boat Canals, whereby they shall be enabled to compete in cheapness of transit with Railways. The patentee Mr. John Lake, C. E., has selected half a mile on the Grand Junction Canal, whereon practically to illustrate his system ; and the length we are told includes unusual Engineering difficulties, must therefore be considered as affording a severe test. It comprises at " its northern extremity, an extremely sharp curve, and about the middle a rise by a Lock of 7½ feet, approached by another curve though of larger radius—beyond this again and on the higher level, it is continued in a straight and then in a curved direction." The lock above referred to is double, and through one of the Chambers the ordinary traffic of the Canal still flows. The gates of the other have been removed, and their functions superseded by an inclined plane constructed on the principles laid down in Mr. Lakes specification. As the work of the level portions of the experimental line was sufficiently great to admit of two boats abreast, the old and new system were worked simultaneously, and the comparison was accordingly direct and palpable.

The substance of Mr. Lakes invention (as stated in The London Mechanic's Magazine) admits of being concisely stated, from its extreme simplicity, and we purpose to give a succinct account of it in this place, that the results already accomplished by it may be fully appreciated. First, the permanent way of the works in every level section of the canal consists of a double line of light iron rails, supported at the uniform height of about 18 inches above the usual high-water mark, upon parallel walings, or beams of wood, to which they are attached by countersunk screws. The walings follow the course of the canal and rest upon rows of piles driven into the bed of the canal, about 15 feet apart. Within the trackway thus formed a number of canal boats with square ends are brought together, and coupled rather closely, so as to constitute a train. Immediately in front of them is another boat, which contains the engine by which motion is to be communicated to the train. The piston-rods of the engine are directed upon cranks in a transverse shaft, which carry the driving-wheels, by the reaction of which upon the rails the whole train is set in motion. In order to produce the requisite tractive force, the driving-shaft is pressed downwards to the rails by a pair of levers, through which it passes freely, and which lie in the direction of the rails. The after ends of these levers are attached strongly to fixed points in the engine-boat, while their other ends are united by a transverse beam of iron, which can be raised or depressed by means of a powerful screw and lever, When the transverse beam is depressed, the driving-shaft and its wheels are pressed down upon the rails, and the engine being set in motion, the entire train of boats is drawn along. On level canals, or those without locks, the arrangements described are all that would be necessary in actual practice ; but to raise the train from one level to another, an inclined plane of extreme simplicity and perfect efficiency has been proposed by the inventor, which at once does away with the loss of time, water, and enormous expenditure incidental to the present system of locking. This incline is, in fact, a double one. The walings ascend upon the heads of piles gradually increasing in height, and strongly framed together in both directions. As the engine would be utterly powerless to draw its train up even a moderately inclined surface, with a smooth rail, a strong rack-work is fixed upon it, which is continued beyond the summit of the incline for about the length of a train. The driving-shaft of the engine is provided with suitable pinions to geer into these racks ; and the continuation of the latter will obviously enable the engine to draw the last boat of the train to the higher level. It is obvious that, by this arrangement, any amount of required fulcrum may be obtained. A line of large rollers or drums, mounted in plumer-blocks about 10 feet apart, which it is proposed to reduce to 5 feet, is fixed upon an inner and lower incline, and over these the bottoms of the boats pass, strips of stout iron being attached to them, to diminish the friction and to protect the botoms, which are also strengthened otherwise. These rollers are continued under water in the upper and lower " pounds" of the canal, so that a support for the boats is provided the moment that the racks and pinions become engaged, and they are deprived of their natural support in the water.

The complete efficiency of this remarkably simple and ingenious mode of working a train of canal boats was amply demonstrated in the trials we witnessed at Grove, though neither in point of power nor in precision of detail is the mechanism at present to be regarded as a fair illustration of it. A small 10-horse engine, with its boiler and fuel, and subsidaiary apparatus, was fitted in the leading boat, to which a train of twelve other boats were attached. These were merely old canal boats, with their sharp ends cut off square, to diminish the resistance in the water, and then cut into two smaller ones, which were laden with blocks of granite and bricks to the extent of about 100 tons. At first the engine-boat was at the foot of the incline, and Mr. Lake ordered the train to be backed, or driven northwards along the level and smooth rails. A turn or two of the large screw sufficed to produce a good bite between the driving-wheels and the rails, and the moment the engine was set in motion the train started, and proceeded with the greatest ease of motion through the water—no eddies resulting from it, nor any undulatory effects that would be detrimental to the banks. The train threaded its way, without difficulty, through the sharp curve at the northern end of the piece, the walings guiding it continuously and gently in its assigned course. In these curves, the only preliminary precaution to be observed is, to give a little divergency at the walings to the point of maximum curvature, and then to contract them gradually for the remainder of the curve, until their normal gage is attained at the next straight piece. In going round a curve thus formed, a train of ordinary length will move freely, without risk of being jammed between the walings. In this trial, the readiness with which a train can be backed, even through a sharp curve, was clearly proved.

The engine was now reversed, and the train drawn forward in the usual manner. Its speed was here considerably above four miles per hour, and was then lessened, to show the control which the engine-driver had over it ; and the levers were released until the wheels slipped upon the rails, and the train proceeded with the momentum it had acquired to the foot of the incline. There eight of the boats were detached ; as the small engine at present in use is not of sufficient power to draw up more than a gross load of about fifty tons. The levers were again screwed down, and the engine set in motion, upon which the pinions geered into the racks, and the engine-boat rose gradually out of the water, commencing its ascent of the incline. As it continued to ascend, it rolled smoothly over the rollers below, and was followed by the four boats attached to it ; all of which were landed, without the delay of a moment, in the upper pound of the canal. From this point the train proceeded along the remainder of its course in the upper level of the canal, and being brought back again to the incline was allowed to descend it. The descent was accomplished with perfect ease, and the absence of all danger. All that the engineer had to do now, was to admit the steam into the cylinder on the other side of the piston, so as to render it effective in checking the motion, which would otherwise give to the mass a destructive momentum. Thus, the same engine which propels the train of boats along the level portions of the canal, by the arrangements here adopted, is also available for elevating from one level to another ; a feat never before accomplished—or shown only in detail—except by means of stationary power.

The advantages of this arrangement over the present canal system scarcely require to be pointed out. Any rational alteration in the extremely inartificial and unphilosophical application of power we now witness on our canals, cannot fail to be productive of advantage ; but it is evident, too, that the train system must be the basis of every approximation to economical working. Past experience, and, indeed, the remonstrances of common sense, declare against the adoption of paddle-wheels, or screw propellers, either in a train of canal baots, or in single ones ; as the confined nature of the channel prevents the access of new water to the moving surfaces, and little better than a churning action is the result. We are therefore driven to substitute for the extremely imperfect reaction against canal water, that against fixed and rigid objects in the vicinity of the boats. This being so, it appears to us that Mr. Lake's system of canal steam navigation embraces all the requirements of the case, and has combined in itself all the favorable circumstances that can be brought to its aid. Having given evidence of its efficiency, a few comparisons will prove its great economy.

First, as regards construction—premising here that existing canals can be altered without any stoppage of the navigation, and the locks and other works, if it should be deemed desirable, may be left freely open for the present clumsy method of hauling. A line of level railway can be laid down on this principle at a prime cost of £1290 to £1500 per mile, according as the wood employed is oak, fir, or beech. An inclined plane of average length would cost £1000, which would be an economical substitution for the expensive works of a lock. A flight of locks might be replaced by a sufficiently long incline ; and thus, upon the whole, places where locks must otherwise be constructed would become the cheapest portion of the entire work, as the inclines might be built upon land with but little excavation. The outlay incurred by laying down the works for an up and a down line of rails, would be far more than returned in a short time by the saving that would arise in the maintenance of the canal. Besides dispensing with the locks themselves, the heavy expense of lockage-water would

be altogether removed; there would also be no charge for lock-keepers, no towing-paths to keep in repair, and all necessity for pumping water would at once disappear. But the greatest economy of all would arise in the cost of haulage. Every canal boat requires at least a staff of three men constantly present, and fresh for duty—one to drive the horse, another to steer the boat, and a third to run forward to get the locks ready. Of course, a large number of persons, and four at the least must be on board, to enable certain of their number to rest when necessary. These men, besides the cost of a fresh horse at every twenty miles, must be kept in pay for each boat, which, on an average, conveys only fifteen tons of cargo. Now, under Mr. Lake's system, three men only would be necessary for a whole train of boats, as no steerers are necessary; and with a thirty-horse engine, which Mr. Lake proposes to use in practice, the train might be of almost indefinite length. The resistance of the water to a canal boat, moving at its usual speed, is about six times smaller than that of the resistance to a goods' train moving on a railway at a speed of twenty miles an hour—at which rate it is essential to carry goods on a railway, to keep the road clear for the passenger trains—and a ten-horse engine is sufficient to draw 1000 tons on a level line of canal, at a speed of three miles an hour. As for the inclines, when once the engine has passed their summit with a train occupying the whole length of the incline, it matters little how many boats are on the level below, for they are then certain of being raised. Upon the whole, the greatest gross load which could be on the inclined plane at any one time could not exceed 120 tons, and the present engine of ten-horse power takes over a gross load of fifty tons. Making the most liberal allowance for every detail of expenditure, the calculation gives from 7d. to 8d. per mile as the cost of carrying 300 tons on Mr. Lake's system—an immense advantage as compared with the existing one, which is at least ten times greater, and even with railway transit.

Such are the merits of Mr. Lake's invention, which, if the Report before us may be relied on, and we suppose it may, promises to restore the canal interest in England to something like the position which it held previous to the construction of Railways. That interest suffered almost annihilation at the hands of its more modern competitors; but in view of the heavy carrying trade in iron, coal, and those articles of bulk and weight least profitable to Railways, and better suited to canal purposes, seeing that the charges of the latter may now be very considerably reduced, whilst the time of transport will be much improved, there is strong ground for the belief that canal property may to a great degree recover its value, and be again brought into active and successful operation. To us, whose canals are upon a larger scale, involving the open navigation of our lakes, this invention would appear to be of slight importance, for we shall never embark in any but ship canals, to which it is inapplicable, and which can alone be preferred, (and then only under peculiar conditions and in particular localities,) to railways. We have considered, however, that the proposition is sufficiently ingenious and interesting to justify its insertion in our columns, and to recommend itself to the perusal of our subscribers.

SCIENTIFIC INTELLIGENCE.

The Meteorology of 1852.

It is only within comparatively few years that observations of sufficient accuracy have been made to enable us to arrive at any exact conclusions as to the great meteorological phenomena which are constantly occurring around us. By the establishment of certain fixed points in selected localities, where observations are regularly made with instruments that have been carefully prepared, and by the system of registering these upon the forms furnished by the Royal Observatory at Greenwich—to which establishment they are returned, and there carefully reduced by Mr. James Glaisher—we obtain results which will no doubt eventually enable us to deduce some law of action that we cannot at present detect. By the information afforded by Mr. Glaisher's quarterly return, published by authority of the Registrar-General, we may now examine all the meteorological conditions of 1852: a year remarkable for its peculiar character,—presenting very singular conditions of temperature, and yet more extraordinary falls of rain. We have carefully gone through all the returns made by Mr. Glaisher—those for the last quarter not having been yet issued to the public:—and from them we are able to present our readers with a digest which will register all the more remarkable phenomena.

During the quarter ending March 31st, the highest observed temper- was 74°, at Manchester and Wakefield. The maximum temperature at the Royal Observatory was 68°·4:—the lowest observed temperature was 17° at Uckfield and 21°·3 at Greenwich. The mean temperature over the kingdom, from Glasgow in the north to Helstone in Cornwall on the south, was 41°·4. During the same period, the mean of the barometer was 29·818 inches; the height in February exceeding that in January at all places,—the difference increasing with the increase of latitude. It is worthy of remark, that during the winter months of 1851-52—that is, the quarter ending in February, 1852—the mean temperature of the air at Greenwich was 40°·1,—being 4°·2 above the average of eighty years. This appears to have been due to the higher temperature of the gulf stream which flows against our western shores; the ocean having a temperature of from 8° to 10° higher than the land during the whole winter. Thus, if frost appeared, the slightest change of wind to the southward brought air warmed by the ocean over the land, and the temperature was immediately elevated.

From the commencement of the year to February the 9th, rain fell on twenty-three days,—but from the 18th to the end of the quarter, rain fell on six days only, and to small amounts:—the entire quantity of rain within the quarter being 4·7 inches.

During the quarter ending June the 30th, the highest observed temperature was 79° at Hartwell House, Norwich,—the maximum at the Royal Observatory being 74°·7. The lowest observed temperature was 22° at Linslade, the minimum at Greenwich being 26°·7,—the mean temperature for the quarter 51°·2, which was somewhat below the usual average. A deficiency of rain prevailed until the end of April; but in June the fall exceeded by more than double the average amount, the sum in inches being 7·0. In April, there fell but half an inch of rain,—in May, nearly 2 inches, and in June, 4·6 inches. The mean of the barometer during this period was 29·764.

The quarter ending September 30th presents some peculiarities; being remarkable for the great heat of July,—very frequent and severe thunderstorms,—frequent and heavy falls of rain,—and a large excess of rain. The highest observed temperature was 95° at Leeds, 93°.7, at Holkham, and 93°·5 at Wakefield. The lowest temperature was 31° at Aylesbury and Wakefield,—thus exhibiting at the latter place the extraordinary range of 62°·5. The highest temperature at Greenwich was 90°·3, the lowest 40°·9:—the mean temperature of the air for the quarter being for the kingdom 61°·8. The mean temperature of July 5 was 14° in excess above its average value, and the following day it was in excess 12°. The rain was 6·6 inches above the average of thirty-seven years:—being in the several months of this quarter 2·3 inches in July, 4·5 inches in August, and 3·6 inches in September,—or, 10·7 inches in the three months.

In this period there were several most remarkable falls of rain in different parts of the country. At North Sheilds 3·1 inches fell in 19½ hours on the 10th of July; and between the 26th and 29th of September the amount of rain at the same place was 6.4 inches. At Grantham the falls of rain were very heavy. On July 5, 1·6 inch fell in about an hour, and on the 2nd of August 0.3 fell in ten minutes. Similar heavy falls, doing much damage to the crops, occurred at Norwich, Southampton, Aylesbury, Newport, Falmouth, Wakefield, and York. Indeed, in every part of the country the rain phenomena assumed a very unusual character. The rain fell on the least number of days at Dunino, Guernsey, Greenwich, Norwich, and Holkham,—and on the greatest number at Royston, North Shields, Wakefield, and Leeds. The least falls took place at Dunino, Leeds, and Gainsborough,—and the mean amount at those three places is 7·0 inches. The largest falls occurred at North Shieds, Stonyhurst, Uckfield, and Ryde,—and their mean is 15·3 inches. The meun atmospheric pressure for the quarter, 29·9111 inches.

The last quarter of the year 1852 presented a temperature 4°·6 above the average of eighty years;—the temperature of the last month, December, being 8°.8, and that of November 6°.5 above the average of the same number of years. Mr Glaisher in his report remarks:—"The daily temperature was below its average value till October 19, and it was alternately in excess and defect from October 20 to October 29. On October 30, a period of warm weather set in, of longer continuance at this season of the year *than any on record*. The mean temperature of the month of November was 48°.9; being 6½° in excess of the average of eighty years, during which period one instance only of a higher temperature has taken place—viz., in 1818, when the average temperature of this month was 49°. The mean temperature of December was 47°·6; exceeding the average of the month by no less than 8¾°, and being of higher temperature than any December as far as our records extend. The nearest approach to this value was in 1806, when the mean temperature of December was 46°.8." The highest observed temperatures were 67° at Jersey, Helstone, and Chiswell Street, and 66° at Manchester. The lowest temperatures for the quarter were 23° at Dunino, 24°·8 at Nottingham, and 25° at York. The mean of the Barometer being 29·710 inches.

The quarter was distinguished by a continuance of the heavy falls of rain which characterized the preceding one. In many places the rain which fell within this quarter was equal to that which occasionally falls in the whole year.

The largest falls of rain were at North Shields, the quantity being 23·6 inches,—at Truro, 22·6 inches—at Torquay, 23 inches—at Guernsey, 22·3 inches—and at Newport, 22 inches. The mean of these gives

a depth of rain equal to 22·7 inches. The least falls of rain occurred at Holkham, Grantham, Cardington, and Gainsborough,—the mean of these places being 9.6 inches. The greatest number of rainy days occurred at Bowdon, Royston, Falmouth, and Ryde. The quantity of rain which fell during 1852 is so very remarkable, that we are glad to have an early opportunity of placing Mr. Glaisher's reduction before our readers:—that gentleman having kindly afforded us the means of doing so.

Fall of Rain in inches, 1852.

Names of Stations.	Fall in Inches	No. of Days.	
Jersey	43·4	174	
Guernsey	49·1	173	
Helston	45·4	183	
Falmouth	59·1	184	
Truro	52·5	161	
Torquay	50·0	175	
Ventnor	43·0	182	
Ryde	48·8	171	
Chichester	39·0	—	
Southampton	49·7	165	
Royal Observatory	34·4	155	
Woolwich Arsenal	31·7	—	
St. John's Wood	35·1	168	
Abingdon, Berks	36·7	—	
Rose Hill, near Oxford	38.0	173	
Oxford University	49·4	178	
Stone	34.3	182	
Hartwell Rectory	33.8	189	
Linslade	34·4	168	
Cardington	30·9	161	
Bedford	32·7	185	
Norwich	32·5	162	
Grantham	32·2	180	
Derby	33·7	183	
Holkham	30·3	173	
Nottingham	37·4	201	
Hawarden	40·2	186	
Gainsborough	25·5	175	I have not visited this station:
Liverpool	31·2	—	I think the guage wrong.
Wakefield	33·5	213	
Leeds	28·4	—	
Stonyhurst	58·3	194	
York	27·3	157	
Whitehaven	50·0	—	11 in. fell in Dec.: average for
Durham	30·6	180	Dec., 3 8 in.
North Shields	58·2	232	Average for the year at this
Glasgow	45·5	188	place, 20·8 in.
Dunino	31·3	133	

It will be seen from this, that, supposing the rain which fell through the year 1852 had rested on the surface of the country—it would have amounted to fifty inches in depth nearly over the counties of Devon and Cornwall—and to between 30 and 40 inches at most inland places. There would thus have been spread over the whole of England a depth of nearly 3 feet of water.

A few parallel examples of heavy falls of rain in this country will bring out the phenomena more strongly. Mr. Luke Howard, in his "Climate of London," informs us that in the latter half of June and the first half of July 1810 the amount of rain was 5·13 inches. At Kendal in 1782 83·5 inches of rain fell, the average result being 55 inches. At Perth, on the 3rd of August 1829, four-fifths of an inch of rain descended in half an hour—and Mr. Howard records the fact of 1⅙ inch of rain having fallen on the 8th May. In the last quarter of 1852 there fell—

		Inches.
October 4	Southampton	1·9
"	Uckfield	2·1
"	Midhurst	1·8
November 6	Falmouth	1·3
" 10	Nottingham	1·7
" 13	North Shields	1·6
December 17	Leeds	1·3
" 19	Glasgow	1·8

So that for remarkable falls of rain—and for a long continuance of wet—the year just past presents a very striking meteorological condition The mean of an extended series of observations gives 31 inches as the annual quantity of rain between the latitudes 50° and 55°—the corrected means of the returns obtained gives 34. for 41852.—*Athenæum.*

New Jersey Zinc and Franklinite.*

Mineral enterprise in this country is rapidly rising to the ascendant. Capital is becoming more ready and anxious, if possible, to invest itself in iron, lead, zinc, copper, and coal mines, than in railroads, which have been, and are now the ascendant interest. It is confidently predicted by careful judges of the signs of the times that, within ten years, more capital will be invested in our mining operations than in our railroads. All the minerals we have named above, are in increased demand, and bear improving prices. The era of fancy mining, for years past potent in fortune-making to a few and in ruin to many, has had its day. Moneyed men are no longer found ready to invest their wealth in paper mines, having no particular existence beyond the ingenuity of their Wall-street creators, and, after a little lapse, to test if the cry for legitimate enterprise indeed meant legitimate, a new sort of enterprise is being inaugurated—to wit: a desire and determination on the part of men of knowledge and means, to enter upon the practical development of some of the vast, undoubted mineral resources of the country.

One mineral enterprise successfully, because energetically, taken hold of and prosecuted, has done more, within two or three years past, to induce the general interest now felt in mining projects, than all others we could name. We allude to the operations of the New Jersey Zinc Company, organized in the spring of 1848, and which, in the face of repeated failures for half a century past to turn the rich zinc mines of New Jersey to practical, profitable account, have been so successful, and that, too, in developing zinc in a more profitable form (paint) than was first contemplated, that its stock, representing $1,200,000 capital, is now considerably above par, and eagerly sought for permanent investments. The success of this enterprise, opposed at first by so many obstacles; the prejudices of legislation, the hesitation of capital, the entire absence of experience in zinc mining and manufacture in this country, has inspired a score of enterprises, most of them legitimate, and many of them destined to great success and profit. It has certainly placed New Jersey in the front rank of mineral States, for, independent of the revelation of her wealth in zinc, it has led to a more thorough examination of her other mineral resources, which are many and rich. But the impetus inspired by the operations of the New Jersey Zinc Company, has not been confined to New Jersey or any particular region; it has spread, and is spreading, over the "Empire" and other States. The working of the zinc mines by intelligent, skillful and energetic minds and hands, has proven that the chief "protection" necessary to develop our mineral wealth is enlightened, practical management, and that mineral operations legitimately entered into and pursued, are no more a speculation or hazard, without tariffs even, than any other business requiring an equal outlay of capital and skill.

As the zinc interest is a new as well as important one, opening another spring of wealth and enterprise, and promising great benefits, commercial, manufacturing and sanatary, our readers will be interested in a brief statistical and general statement of the zinc resources of New Jersey, and the operations of the New Jersey Zinc Company. The zinc mines are located in the township of Franklin, Sussex County, New Jersey. They are the only mines of pure oxide of zinc known. They are mixed in their deposits with other minerals, chiefly Franklinite iron ore and manganese. Vast deposits of this Franklinite lie contiguous, similarly blent with zinc and manganese. The total extent of the two chief minerals, all of their kind located compactly in that region, is not definitely estimated, but it is immense—exhaustion for centuries to come is out of the question. It will be sufficient for the information of our readers to take the data of that portion belonging to the New Jersey Zinc Company, which has been carefully examined by Dr. Charles T. Jackson, State Assayer of Massachusetts, and United States Geologist for the mineral lands of the United States in Michigan, &c., whose estimate is verified by Major A. C. Farrington, the eminent Mining Engineer of the Zinc Company, and other eminent scientific men. Dr. Jackson gives as the amount of the Zinc Company's Franklinite, above water drainage, 1,115,468 tons; amount of zinc, 1,188,572 tons. The veins are perpendicular, and, according to the law of such veins, extend down farther below water drainage than ever plummet sounded, and are richer, if anything, as they descend, so that it is safe to say both zinc and Franklinite are inexhaustible. But if they were not so in the Zinc Company's mines, there is vast store further in reserve. It is difficult to say which of these two minerals is most valuable; both are *sui generis* and precious. As the zinc is furthest developed, we will give its analysis first:—

Oxide of zinc say	60
Franklinite say	20
Manganese say	20
Total	100

* Hunt's Magazine.

A close analysis might show a slight but not material difference When taken hold of by the present successful company, the design was to manufacture the zinc of Commerce, zinc ware, &c., but early experiments by the company led to the discovery that a more immediately marketable, profitable and beneficial article could be made—to wit: the zinc paints, now so rapidly supplanting lead and other paints. It was found that a pure and brilliant white sub-oxide could be extracted from the ore with great ease and facility, and two shades of white, one a silver white, and the other a beautiful slate color; while the red oxide could be pulverized in the ore, and rendered into a brilliant brown paint, which, in turn, by admixture with other preparations, would also make a superior black paint. Here was a new field indeed. The known poisonous and other deleterious properties of lead, seemed to define the mission of the Zinc Company, and to demand that it should first become a creator of a healthful and more durable and brilliant, as well as a cheaper paint. They accepted the summons, and erected extensive zinc paint works at Newark, after long and expensive, but never discouraging experiments, and during ten months of 1852—the first year of comparatively perfected machinery and operation—their paint sales from their warehouse in this city—supervised by Messrs. Manning and Squier, 45 Dey-street—reached $185,577 28, and they were, even at that, unable to meet the press of orders, though their works at Newark turned out ten tons of paints per day. Those works are being enlarged, and will require repeated extension, if, as we think it is, zinc is destined to supplant lead as a paint; for there is now annually consumed by the United States, 50,000 tons of lead in paints.

A glance at the process of making zinc paint, or rather extracting the sub-oxide, will not be uninteresting. The mines are about thirty-five miles from Newark, and the ore requires at present to be carted eight miles, (a rail is being laid for this transport in future,) and is then conveyed to the paint works by water. The ore, on arriving at the works at Newark, is placed in heaps and roasted, for the purpose of softening it. It is then ground into small pieces, when it is mixed with an equal quantity of coal, used for de-oxidizing the different substances of which the ore is composed. It is then put in smelting furnaces, where the action of the carbonic acid gas, supplied through the coal, disengages the component parts of the ore, and causes the zinc to rise in vapor, which vapor is conveyed into a large tube, thro' which a quantity of atmosphere is constantly driven, and the zinc, uniting with the oxygen, produces the white oxide of zinc, and this is driven by a blast into a collecting chamber, from whence it is taken for use. The oxide is then mixed with oil by means of machinery, and thus is produced the beautiful white zinc paint. The manganese in connection with the zinc, is found to be, as though specially provided, a natural dryer for the paint.

When the Zinc Company commenced operations, they had comparatively no data to go by. The zinc paint introduced in France by the discoveries of Le Clair and Sorel—for which they were awarded the cross of the Legion of Honor and other dignities—though subsequent to the use of a perhaps inferior article, collected through some experiments (not for that purpose) many years since, and used on the mansion of the late Hon. Samuel Fowler, of New Jersey, then proprietor of the zinc mines; being manufactured by a double process, first resolving the zinc (carbonate) to metal, and then extracting the oxide, gave little benefit to the American enterprise. But the Zinc Company had an indomitable man in James L. Curtis, formerly an extensive merchant of our City, at its head, assisted by able coadjutors, and he knew no such word as fail. Collecting at home and abroad such data as could be had, he made Yankee invention, science, and skill, answer for the necessary balance, and the result has been a perfection and simplification in the operations of mining and manufacture of zinc not excelled, if equalled, in the world. Yet the company will doubtless add improvements from time to time, for there would seem to be no limit to the inventive capacity of Americans. The advantages of zinc over lead as a paint are these:—Repeated tests make 60 pounds of zinc white equal to 100 pounds of lead in covering surface, and the relative cheapness, therefore, stands:—

100 pounds best lead, say 7½ cents per pound	$7 50
60 pounds best zinc, say 9 cents per pound	5 40
In favor of zinc	$2 10

The superior cheapness of zinc is the great commercial advantage in its favor over lead. Besides this, zinc is superior in whiteness, brilliancy, and durability, and is entirely free from the poisons in lead which generate several diseases, well known to workers in lead, painters, tenants of freshly painted rooms, and medical men. The white zinc resists the action of all gases that yellow and tarnish lead, and holds brillant as an inside paint for years. In color, it compares with lead as porcelain white does with common earthen white. It can be used with impunity while rooms are occupied,-while medical men —vide the evidence in Tanquerel's octavo work on lead poisons and lead diseases—agree that lead painted rooms should not be tenanted under two or three months for safety. The zinc colors, for outside painting, requiring but little oil, dry suddenly, and form a metallic coating on wood, brick, iron, &c., impervious to weather and salt-water, and are more nearly fire-proof than any other paint known.

They act galvanically on metal surfaces. We have before us at this writing the testimony of the Supervisor of the New York and New Haven Railroad, the Superintendent of the Navy Yard at Gosport, Virginia, a special committee of the Common Council of this city —zinc paint has been tested and ordered by the Common Council for the use of the city buildings—and other eminent parties, many of them practical painters and users of lead all their lives, who have tested the zinc paints on railroad depôts, locomotives, ships, buildings and otherwise, and their testimony is unanimous—without considering the sanitary reason—in favor of zinc over lead. To our mind, the sanitary reason is the greatest of all in favor of zinc. But though the present operations of the Zinc Company are confined to the manufacture of paints, this is but a branch of the prospective interest. Lead is a poisoner, not only in paint but in water-pipes, roofing, cistern-lining, &c., for all of which uses zinc is a cheaper, better, more durable, and healthful substitute. Slightly alloyed with copper, it makes a sheathing for ships much cheaper and far more durable than copper, because impervious to the corrosive action of salt water. Manufactured into culinary ware, covers, spoons, forks, etc., zinc (the New Jersey) makes an article more durable and beautiful than Britannia or nickel, while the strength of the metal will allow it to be made much lighter. We can see, not far ahead, a vast manufacturing interest on these accounts springing up around the zinc mines of New Jersey.

The Franklinite, where that is the chief deposit—and the Zinc Co., have, as already intimated, chief deposits both of Franklinite and zinc —bears the following analysis, made by Dr. Jackson:

Silica, (si. 03)	0.299
Franklinite, (Fe. 203)	66.072
Zinc, (zn. 0)	21.395
Manganese, (mn. 03)	12.242
	100

The admixture of zinc with the Franklinite is found to destroy its tendency (if it otherwise had any,) to granularize, and renders it thoroughly fibrous, making it when properly worked into iron, the toughest and strongest that has ever been tested. According to Tredgold's test, the Franklinite stands thus:—

Best Swedish bar iron, inch square bore	lbs. 72.840
Inferior " " "	53.224
Best English " "	61.660
Inferior " " "	55.000
American Franklinite "	77.000

It has been tested in this city and in Baltimore with similar results, and a French test, in the Government Marine Forges at Paris, made the difference in favor of Franklinite much greater. We have seen it variously tested, every species of trial only adding to the proofs of its wonderful nerve and strength. Wire of whatever size, made of other iron, is flawed and broken at a few twists, but we have seen wire made from the Franklinite twisted twenty times without inducing a flaw. Resolved to steel, it makes an article of the most brilliant character. Competent judges—our most extensive and practical iron and steel workers—accord a superior value to Franklinite, over any other iron for uses requiring the greatest toughness and strength. For steam machinery, suspension bridges, wires and such lesser forms of iron as require a union of delicacy and strength, the Franklinite must be, as soon as placed before the public, in great demand. It forms an admirable alloy or emollient with inferior iron and ores, changing their hard granular nature into ductility and strength. The residuum formed in the furnaces of the zinc paint works, from the per cent of Franklinite discharged, is admirable for admixture with inferior iron; retaining as it does, just enough zinc to neutralize the granular character of such iron. It is beginning to be largely sought and used for that purpose, and for fluxing iron in the process of puddling. It may seem a matter of surprise that an iron ore so near the seaboard and the chief market and mart of capital of the Union, and with such a character, should not have been long ago developed. The same surprise may be expressed over the zinc. Repeated trials for half a century have been made with both minerals, but through lack of practical knowledge, inefficient operatives, and the little interest taken in encouraging mineral enterprises, they all failed, until the energy, genius, and tact of Col. Curtis and his coadjutors, took hold of the work.

The chief credit of the successful operations of the New Jersey Zinc Company, forming an era in American mineral history, is acknowledged to belong to Col. Curtis. He had the faith and boldness to take a matter of "repeated failures" in hand, and allowed no discouragement to daunt him.

"Where there is a will there is a way," is an old adage, and what Alexander the Great said to a halting, doubting subaltern, is true forever, "There is nothing impossible." If the Gordian knot will not be untied by hand nor teeth, untie it with the knife or sword. Col. Curtis who has been the active head of the Zinc Company from the day of its organization until a few days since, when he resigned on account of pressure of private business—but not until the success of the enterprise was perfect—had sagacity enough to know that operators in a new sort of enterprise must first learn how to operate, and as it required a large amount of science, skill, and expenditure, all his predecessors had been wearied or frightened from the work. He was not: he hunted up the science and skill, and the means to pay it well; and the result, after four years of anxious and unceasing effort, is a brilliant reward of triumph to himself and co-laborers, and for the mineral resources of our country.

The great impediment in the way of turning the Franklinite to account, was the trial of its ores in ill-adapted furnaces. In the common iron furnace, Franklinite comes to a state of nature before it leaves the furnace, and it only required the observation of a plain, unpretending iron worker, to see, after a little thought, that furnaces of less height and much cheaper, would obviate the difficulty. The zinc was found, also, to choke the furnaces in its escape from the iron, but the Zinc Company discovered in a little time that this 15 or 20 per cent of zinc, instead of raising the mischief with the Franklinite, could, by the addition of a simple apparatus to the furnace, be collected for paint, and thus pay, nearly or quite, the cost of making the Franklinite ore into iron, and the collection of the zinc; opening a splendid field for the manufacture of iron on free-trade principles. The zinc and manganese are finally found admirable, aye, invaluable coadjutors with the Franklinite, in promoting its working into iron.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—March, 1853.

Latitude 43 *deg.* 39.4 *min. North. Longitude,* 79 *deg.* 21 *min. West. Elevation above Lake Ontario :* 108 *feet.*

Magnet	Day.	Barom. at tem. of 32 deg.				Temperature of the air.				Tension of Vapour.				Humidity of Air.				Wind.			Rain in Inch.	S'nw in Inch.
		6 A.M.	2 P.M.	10 P.M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.		
c	1	29.281	29.303	29 323	29.308	34 8	39 5	29 8	34.72	0.191	0.218	0.154	0.185	95	91	94	92	N W b N	N W b W	Calm.	- -	0.1
cd	2	.309	.315	.408	.357	33.7	37.1	29 8	33.03	.174	.171	.126	.159	91	78	76	84	S W b S	S W b S	N b W	- -	0 3
c	3	.495	490	.568	.523	24 2	33.9	25 5	27.03	.122	.124	.107	.116	92	63	77	78	N W b N	S W b W	N W b W	- -	- -
"	4	.531	.471	.481	.491	17.6	28.7	13.3	21.42	.083	.134	.098	.102	81	84	94	85	N W b N	S S W	Calm.	- -	Inap
c	5	.460	.474	.558	.503	13.1	31.0	25 3	23.60	.072	.122	.109	.107	85	71	78	81	Calm.	S W b W	S S W	- -	- -
b	6	.5-2	.457			18 3	34.4			.086	.156			82	78			W N W	S b E		- -	Inap
e	7	.562	.448	.373	.451	31 4	35.5	32.8	33.17	.155	.184	.176	.169	88	89	95	90	S W	S S W	S b W	- -	0.3
e	8	.586	.751	·761	.711	21.4	35 0	30.2	30 88	.117	.115	.150	.135	87	56	89	79	W N W	N b W	N N E	- -	4.5
e	9	.456	.688	30.022	.752	26 9	28.0	17.0	23.45	.137	.119	.077	.091	93	77	79	84	N E	N W b N	N W b N	- -	0 3
	10	30 158	30.107	29 951	30 060	2.9	26.9	23.8	18 60	.042	.119	.117	.001	80	80	88	81	N N W	E b N	N E	- -	- -
"	11	29 825	29.738	29.740	29.763	23 3	37 3	33 7	31.65	.111	.193	.166	.155	86	87	86	86	N E b N	N E b E	N E	- -	Inap
e	12	.712	.568	.566	.610	33 4	34 4	33.4	34.05	.179	.179	.178	.180	90	91	94	92	E N E	E b N	Calm.	Inap	Inap
c	13	512	.515			33 0	34 6			.169	.161			90	81			W S W	W b N		- -	0.8
b	14	.547	.700	.819	.721	18.3	15.7	9 7	13 85	.063	.049	.060	.059	61	51	81	68	N W	N W b W	W N W	- -	- -
c	15	.951	.904	.889	.916	—0 1	19.7	16.5	12.65	.044	.064	.084	.065	93	57	87	78	N W	W	W S W	- -	- -
ab	16	.968	.905	.700	.881	6 5	29.8	28.8	22.73	.055	.138	.121	.109	87	83	76	83	W S W	S S W	S E b S	- -	- -
cd	17	.654	.456	.304	.460	21.1	35.6	33 7	32.12	.128	.144	.175	.149	96	67	91	83	N E	E	Calm.	0.410	- -
b	18	28.901	.116	.512	.203	35 9	40.2	33 0	35 55	.202	.192	.137	.170	96	78	73	81	N N E	N W	W N W	.160	- -
c	19	29.810	.829	.735	.792	24.4	36 2	32.5	31.07	.125	.152	.162	.140	93	72	88	80	N W	S	S b W	- -	- -
b	20	.718	.576			32 7	46 8			.159	.285			86	90			Calm	S S W		- -	- -
a	21	.359	.280	.306	.311	40 8	46.9	39.3	42.88	.208	.232	.193	213	83	83	81	77	S W b W	S W b S	S W	- -	- -
a	22	.321	.334	.332	.328	32 7	44.2	33.0	37.10	.159	.213	.155	.175	86	74	82	79	W N W	W N W	N N E	- -	Inap
"	23	.280	.200	.378	.320	30.2	37.8	33 3	33 93	.150	.199	.127	.159	89	88	66	81	N W b W	S W b W	W	- -	Inap
b	24	.412	.486	.563	.509	30 4	36 8	30.5	32.55	.162	.145	.130	.150	96	67	77	82	W S W	N W	Calm.	- -	- -
"	25	.665	.551	.435	.539	26 6	45 0	33.9	35.60	.128	.246	.172	.179	87	83	89	84	Calm	S W b W	N b E	0.110	- -
	26	.177	.052	.149	.125	34 0	39 5	35.9	36.18	.181	.216	.191	.195	94	89	91	92	E b N	N E b E	Calm.	.050	- -
	27	.399	.469			29 1	36.9			.124	.171			77	79			N N W	N W		.070	0.8
	28	.642	.619	.814	.719	25 8	30.4	30.5	32.37	.110	.128	.116	.121	78	53	68	67	N W	W b N	W b N	- -	- -
	29	.842	.695	.531	.661	25 2	46.0	37.5	37.25	.104	.230	.195	.175	75	75	87	77	Calm	S b W	Calm.	- -	- -
	30	.416	.419	.547	.469	34 5	56 3	40.6	43.95	.157	.149	.169	.159	78	33	67	59	W	W N W	N W	- -	- -
	31	.518	.451	.394	.457	37.5	34.3	35 2	36 05	.194	.182	.188	.192	87	93	92	91	N N E	N E	N E b N	.280	- -
	M	29.551	29 535	29 565	29 553	25 65	35 99	28.65	30 65	0.131	0.162	0 142	0.145	86	75	83	81	Ml's 4.69	Ml's 8.54	Ml's 4 06	1 08	07.1

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1756.22	2360.17	855 37	681.71

Mean velocity of the wind - - 5.87 miles per hour.
Maximum velocity - - - - - 26 0 ml's per h'r, from 1 to 2 p.m. on 14th.
Most windy day - - - - - 14th : Mean velocity, 15.16 miles per hour.
Least windy day - - - - - - 1st : Mean velocity, 1.93 ditto.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 30.168, at 8 A. M., on 10th } Monthly range:
Lowest Barometer - - 28 892, at 8 A.M., on 18th } 1.276 inches.
Highest observed Temp. - 56 3, at 2 P. M., on 30th } Monthly range:
Lowest regist'd Temp. - —0.1, at 6 A.M., on 15th } 56.4
Mean Highest observed Temperature - - 36 .76 } Mean daily range:
Mean Thermometer Minimum - - - - - 21.94 } 14.82

Greatest daily range - - - - -26.0 from 2 P.M. on 9th, to 7A.M. on 10th.
Warmest day - - 30th - - - Mean Temperature - 43 95 } Difference:
Coldest day - - - 15th - - - Mean Temperature - 12.65 } 31.30

The "Means" are derived from six observations daily, viz., at 6 and 8 A. M., and 2, 4, 10 and 12, P. M.

Aurora Observed on 6 nights. Possible to observe Aurora on 16 nights.

A distinct shock of an Earthquake was felt in Toronto on Sunday, the 13th, between 5 and 6, A. M. (*See Canadian Journal for March.*)

The Ice totally gone from Toronto Bay on the night of the 31st.

Comparative Table for March.

Ye'r	Temperature.				Rain.		Snow.		Wind. Mean Velocity
	Mean.	Max.	Min.	Range.	D'ys	Inches.	Dy's	Inch.	
	°	°	°	°					
1840	33.29	56.9	8.7	48.2	8	1.640	8	--	Miles.
1841	27.84	53.5	— 6.9	60.4	5	1.170	7	--	--
1842	36.20	68.7	14.9	53.8	4	3 150	8	--	--
1843	21.70	38 6	— 2.8	41.4	2	0.625	18	25.7	--
1844	31.68	50 3	9 6	40.7	8	2.470	8	14.0	--
1845	35 93	61.7	9.9	51.8	5	imperfect	8	2.8	--
1846	33.73	49.3	7.6	41.7	9	1.965	5	2 3	--
1847	26.68	44.3	4.8	39 5	5	0.850	6	4.2	--
1848	29.12	58.9	0.9	58 0	5	1 220	6	9.7	5.80
1849	33.93	53.4	15.4	38 0	7	1.525	2	2 3	5.37
1850	29.73	46.0	6.0	40 0	2	0.745	7	11.2	7.62
1851	33.14	58.7	13.1	45.6	3	0.770	9	8.8	7.65
1852	27.79	44.8	— 3 2	48.0	8	3.080	12	19 5	5.81
1853	30.65	56.3	— 0.1	56.4	6	1.080	8	7.1	5.87
M'n	30.81	52.96	5.56	47.39	5	1.561	8	9.78	6.35

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, March, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 *deg.* 32 *min. North. Longitude*—73 *deg.* 36 *min. West. Height above the Level of the Sea*—118 *ft.**

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Velocity in Miles per Hour.			Rain in Inch.	Snow in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.			6 A. M.	2 P. M.	10 P. M.	
1	29.438	29.424	29.384	20.	30	24.5	.129	.168	.153	1.00	.90	1.00	N E b E	N E b E	N E	13.66	10.21	10.10		5.22	Snow.	Snow.	Str. 10.	
2	.419	.485	.565	25	46	28	.141	.28	.154	.90	.86	.89	N	N E b E	N E b E	6.25	0.68	0.03		1.60	Str. 10.	CumStr9	Oercast.	
3	.669	.509	.528	20	31.5	25	.129	.156	.141	1.00	.80	1.00	N E	N E	N E	9.80	9.03	10.41		1.00	Str. 10.	Lgt. Cirr.	Str. 10.	
4	.579	.569	.670	19	49	14	.125	.320	.104	1.00	.90	1.00	N E	E b S	S W	16.54	1.05	0.03			Str. 10.	C.C.Str.8.	F. Z. C.	Zod. Light, at 7, p.m.
5	.515	.454	.607	22	40	28	.139	.219	.173	1.00	.82	1.00	N E b N	N E b N	NW b W	6.39	10.25	1.91			Overcast.	Str. 10.	Oercast.	
6	.611	.539	.576	21	55	26	.118	.331	.161	.88	.74	1.00	NW b W	S W b S	W S W	2.91	1.64	0.80			CumStr8	Cir. C. 4.	Oercast.	
7	.626	.532	.486	20	45	30	.129	.260	.180	1.00	.83	.97	S W b W	SW b W	S b W	4.47	4.19	8.18			Clear.	CumStr.8	Clear.	Crows first seen.
8	.496	.679	.836	32	45	23	.199	.235	.127	1.00	.74	.88	W	N W	N E	4.25	13.80	3.17		1.10	Clear.	Cir. C. 2.	Pght crrl	Aurora Borealis.
9	.779	.550	.827	22.5	30	20	.126	.145	.114	.89	.78	.87	N E b E	N E b E	N N W	6.35	8.62	15.16		4.46	Snow.	Snow.	Clear.	
10	30.194	30.202	30.149	0	41	6	.046	.146	.062	.95	.53	1.00	W b S	W b S	S	2.21	1.12	0.10			Clear.	Clear.	Clear.	
11	30.090	29.939	29.903	2	30	26	.049	.138	.143	.95	.74	.90	N E b E	N E b E	N E b E	3.69	5.25	0.37			CumSt.8.	Str. 10.	Oercast.	
12	29.823	.701	.592	15	44	33	.108	.223	.197	1.00	.73	.95	N E b E	N E b E	N E b E	2.30	5.00	1.00			Str. 10.	Str. 10.	Str. 10.	
13	.467	.406	.432	33	41	31	.197	.217	.171	.95	.79	.89	W	W N W	W	1.20	14.35	5.88			Str 10.	CumStr.9	C. Str. 8.	
14	.437	.497	.619	22	24	4	.134	.727	.056	.95	.85	.96	W	W N W	W N W	9.02	25.55	25.76			Cir. C. 2.	C.C. St. 4	C. Str. 10	
15	.773	.727	.775	— 3	20	1.5	.040	.083	.051	.95	.57	1.00	W N W	W N W	N W	20.50	21.07	16.62			C. Str. 10	C.C. St. 2	Clear.	
16	.945	.899	.907	— 5	32	10	.036	.128	.089	.95	.60	1.00	W	W	W S W	10.60	12.50	11.25			Clear.	Clear.	Clear.	
17	.905	.654	.572	5	33	23	.060	.187	.106	.95	.90	.73	S W	N E	N E	3.12	3.18	3.10			Cir. C. 4.	CumStr.4	Oercast.	
18	.161	28.902	.284	22	30	31	.139	.160	.192	1.00	.86	1.00	N E b E	N E	W N W	8. 8	17.94	10.42		4.10	Snow.	Snow.	Str. 10.	
19	.629	29.715	.738	20	35	21	.121	.170	.134	.93	.76	1.00	W N W	W N W	W S W	15.00	18.75	8.75			Clear.	Cir. C. 4.	Clear.	
20	.895	.649	.489	17	50	35	.109	.246	.213	.94	.65	.95	W S W	W S W	S b W	7.33	3.75	0.69			Clear.	C.C. Str.8	Clear.	
21	.145	.285	.266	28	50	38	.163	.264	.246	.94	.70	1.00	S S E	W S W	W b S	0.69	2.57	4.45	Inap.		Clear.	Cir. C. 2.	Cum. 4.	Slight Rain at 6, p.m
22	.235	.284	.311	35	54	36	.213	.216	.210	.95	.76	.91	W S W	W S W	W	0.90	11.24	7.11			Clear.	CumStr5	C. Str. 10	
23	.301	.263	.299	35	53	33	.186	.274	.187	.83	.66	.90	W S W	W S W	W S W	4.21	2.14	6.75			Str. 10.	CumStr9	Cum.C. 6	
24	.525	.577	.573	31	55	29	.188	.295	.170	.93	.66	1.00	W S W	W b N	W b N	7.50	6.14	10.21			Overcast.	CumStr4	Cirr. C. 4	
25	.608	.489	.493	31	49.5	32	.185	.186	.189	.96	.51	.93	W	W S W	W S W	8.16	8.19	6.87			Overcast.	CumStr9	Clear.	
26	.462	.324	.207	30	32	28	.177	.191	.173	.95	.95	1.0	E N E	N E b E	N E b E	0.95	6.25	9.27		2.00	Str. 10	Snow.	Snow.	
27	.314	.379	.187	29	40	31	.152	.194	.187	.85	.73	.97	W N W	W N W	W	10.41	10.54	21.91			Clear.	C. Str. 10	Oercast.	
28	.603	.681	.787	30	37	30	.169	.218	.186	.91	.92	1.00	NW b W	NW b W	NW b W	16.93	14.27	8.33			CumStr9	CumStr9	d. oercast	
29	.819	.836	.616	30	53	36	.178	.210	.220	.96	.63	.96	W b N	W S W	W S W	2.43	3.79	8.82			CumStr9	Pgt cirr 1	Oercast.	Wild geese first seen
30	.387	.421	.469	36	57	36	.219	.422	.230	.95	.89	1.10	W S W	W S W	W N W	6.13	4.11	6.22	Inap.		C. Str 10	Str. 10.	Clear.	Slight Rain at 2, p.m.
31	.597	.571	.535	37	56	37	.216	.343	.220	.89	.74	.95	W N W	W S W	W S W	8.13	1.13	2.72			Clear.	Clear.	Oercast.	

Barometer.	Highest, the 10th day	30.202
	Lowest, the 18th day	28.902
	Monthly Mean	29.584
	" Range	1.300
Thermometer	Highest, the 30th day	57.°
	Lowest, the 16th day	— 6.0
	Monthly Mean	29.68
	" Range	63.°

Mean of Humidity—.881.

Greatest Intensity of the Sun's Rays—79.°6.

Most Prevalent wind—W. S. W.

Least do. do. S.

Most Windy Day—the 14th day, mean—20.11 miles per hour

Least Windy Day—10th mean—1.14 miles per hour.

Snow fell on 7 days, amounting to 19.48 inches.

Rain fell on 2 days.—Inapp.

Aurora Borealis visible at observation hour, on 1 night.

Zodiacal Light visible on 1 night, at 7, p. m.

The Electrical state of the Atmosphere, has been marked during the month *generally* by Moderate Intensity, and the 9th and 26th days were remarkable for a very high Intensity of Positive Electricity; the 18th day indicated a high Intensity of Negative Electricity.

* NOTE.—Since the last Report, the Surveyors connected with the St. Lawrence and Ottawa Grand Junction Railway, have taken levels passing through this place, and have kindly furnished me with data, whereby I am able to state that this place is 118 feet above the level of the sea.

Extract from the Report of the Sixth Exhibition and Fair of the Massachusetts Charitable Mechanics' Association.

647. WILLIAM BOND & SONS, Boston. One Astronomical Clock, and a Spring Governor. The object to be attained by this novel contrivance is that of regulating the movement of a rotating cylinder, so that its motion may not only be steady and uniform, but that its revolutions may be performed with accuracy in any given time desired.

There are, doubless, many situations connected with science and the arts, where rotary motions regulated with great accuracy, may be applied with great advantage. The experimenters upon Hydraulics, Hydrostatics, &c., we think will find it a useful appendage to their already very extensive apparatus.

Within the past few years there have been several astronomical observatories established in the United States, where observations are now being made, not only with great care and ability, but with becoming zeal and regularity. And connected with these Astronomical inquiries, are those of its kindred science Geodesia, which are now being, and have been for some time past, vigorously prosecuted or carried forward under the patronage of the General Government. To the combined observations and operations of these kindred sciences (if it be proper to consider them as separated) are we indebted for a knowledge of the figure and magnitude of not only our own planet, but of all the other planets belonging to our system. Our planet being a standard upon which a great portion of the astronomical calculations are based, the importance of ascertaining its magnitude with as great a degree of accuracy as we well can, must be apparent to every one who has given any thought to the subject. Besides, the accuracy of the charts of not only our own Coasts and the Oceans adjacent, but the Coasts and Oceans of the whole world are more or less dependent upon this element.

The invention of the Magnetic Telegraph, and the construction of Telegraphic lines, as it were, from one end of our country to the other, which by being connected with the several observatories, afford a means of communicating the moment of time of any phenomena observed at one observatory to that of another and *vice versa.* By this means the difference of time between any two observatories, is determined with a greater facility and degree of accuracy than by any other method now practised; and then having extended the Geodetic surveys from one observatory to the other, we thereby obtain more accurate data for solving the Grand Problem, viz., the magnitude and figure of the earth, than we have been enabled to do by any other known means. The great desire of making these communications with as great a degree of accuracy as their nature will admit, was the exciting cause of this invention. But the invention is not confined to distant communications alone; it is equally valuable and useful in recording at the observatory where it is situated, the moment of time of any observed phenomenon.

This invention, properly considered, consists of what we shall term an Electro-Telegraphic Clock and the Spring Governor. The Clock which in its general construction does not materially differ from other Astronomical Clocks, was not exhibited at the Hall. It being somewhat difficult to give a complete description of this apparatus without drawings, and as the association cannot well insert in their publication of notices, cuts representing the articles exhibited, we shall only endeavor to give such a general description as will convey an idea of the invention and its application.

First, *The Clock.* As before stated the several parts of the Clock are not dissimilar in form to clocks heretofore in existence. The novelty of the Clock consists in insulating the axis or pivots of the escapement wheel from the plates which sustain the other portion of the clock-work by a ring of Shell Lac Gum, bushed with brass washers or discs;—and the axis of the steel pallets is in like manner insulated from the other parts of the clock-work. The pinion which connects the escapement with the train of the clock is insulated from its axis by Shell Lac Gum;—the Pendulum also is so contrived as to be insulated from the arm of the pallets with which it comes in contact, by an arrangement of Shell-Lac Gum. Electrical or circuit wires are secured to portions of these insulated parts which sustain the axis or arbors of the escapement and pallets, so that when either pallet comes in contact with an escapement tooth, the Galvanic circuit is closed, and when the contact is broken, (as it must be at every oscillation of the pendulum,) the Galvanic Circuit is opened, and thus pulsations of Electricity corresponding to the oscillations of the pendulum successively pass over the wires. Then, by the aid of the Spring Governor, an intelligent record of the electrical pulsations or beats of the clock is made.

Second, *The Spring Governor.* This part of the invention was on exhibition in the Exhibition Hall, and consists of a double train of Clock-work united into one upon an axis of a Fly-wheel. (We speak of this machine as consisting of a double train of clock-work because it receives motion from two weights.) The clock-work, consisting of small brass wheels and pinions, is arranged between two brass plates some four inches apart, and probably twelve or fourteen inches long. Near either end of these plates is a strong axis to which an apparatus is applied for receiving a cord, upon which weights are suspended to give motion to the trains;—these axes and pulleys we shall call prime movers. A few wheels of the train distant from one of these prime movers, is situated an escapement wheel, into the teeth of which pallets are operated by the oscillations of a pendulum, as in ordinary clocks, the escapement wheel is so connected with its axis by a spring, as to allow the axis to move while the wheel is detained by the pallets. From the pinion upon the arbor of the escapement wheel, the train is continued through several wheels and pinions, to a Fly wheel. From the prime mover at the other end of the plates a train of wheels and pinions extends also to, and connects with the Fly. Near this prime mover is situated a long shaft or arbor which extends through one of the plates some twelve or fourteen inches, its end being sustained by a proper support attached to the table upon which the whole apparatus rests. Upon this shaft a cylinder of some five or six inches in diameter and some ten inches in length, is firmly fixed, and of course revolves regularly with it. When the machine is in order to operate, this cylinder is covered with blank paper. A slide apparatus is attached to the table near to and parallel with the cylinder, upon which an Electro-magnet, in the U form, is fixed; and the slide is so connected with the clock-work, that it receives a regular motion therefrom, and is thereby moved from one end of the cylinder to the other. The magnet with its armature is so arranged that it gives a lateral or horizontal motion to a lever to which a pencil or pen is attached, which rests upon the paper with which the cylinder is covered. The instrument is also provided with a finger key, by which the circuit may be opened at the instant of any observed phenomenon, and thereby the regular flow of the electrical current will be broken;—at this instant the U magnet releases its hold upon its armature, and it moves laterally and thereby records the pulsation by a mark, in the form of a saw tooth upon the paper which covers the cylinder.

Having thus briefly described the apparatus and its uses, let us now, for the purpose of illustration, consider the whole apparatus to have been properly adjusted and in a condition for operation, with the Battery connected with the insulated portions of the Clock-work. The clock being then put in motion, its beats may be distinguished at the distant station by the clicking noise of the armature upon its magnet, while the pencil attached to the lever which bears the armature, will, by its lateral motion occasioned by the opening of the circuit, record the beats or oscillations upon the cylinder,—and these phenomena will be repeated for every oscillation of the pendulum.

To render our description plainer, let us suppose one of the observatories to be situated at Cambridge and the other at Washington, and the Astronomers to have agreed to observe the transit of a particular star over their respective meridians. The star of course makes its transit across the Cambridge meridian first, and at the moment of its culmination the observer places his finger upon the finger key, and thereby causes an electrical pulsation, which is transmitted to Washington, and is there recorded upon the cylinder of the Spring Governor. After the lapse of the difference of time between the two observatories, the Astronomer at Washington observes the transit of the same star, and at the moment of its culmination he touches the finger key and thereby causes an electrical pulsation, which is transmitted to Cambridge, and is there recorded upon the cylinder of the Spring Governor. Then, by an examination of the records upon the cylinders, the difference in time can be readily ascertained, and by a mean of many operations of a like character, not only the difference in time between the places may be ascertained, but the actual time, which should be allowed for the transmission of the electrical pulsation in connection with the movement of the armature, may be determined.

This method of recording the instant of an observed phenomenon, whether to be transmitted to a distant observatory, or to be used at the observatory where the observation is made, possesses this peculiar advantage over any other with which we have any acquaintance, viz: the observer observes the phenomenon without being embarrassed with the trouble and anxiety of counting the beats of the clock or chronometer, or estimating the fractions of the interval between the beats at the instant of observation. In a practical sense his mind may be fully concentrated upon the phenomenon of observation.; the touch upon the finger key being mostly mechanical, requires no mental exertion; and further, the beats of the clock being recorded upon the paper attached to the cylinder by equi-distant marks upon a spiral line, furnishes a scale by which the fractional interval of the beat may be measured with great accuracy. Since the exhibition, the apparatus has been tested, and is found to more than equal the expectations of all who have seen it. The Committee, therefore, in consideration of the great aid which this invention promises to a great variety of scientific investigations, cheerfully recommend that there be presented to the inventor, by the Association, as a token of their approbation, a *Gold Medal.*

On Chromatic Photo-printing, being a mode of printing textile fabrics by the chemical action of Light, '*by* Mr. R. Smith.—The author proposes to employ the chemical agency of light in dyeing or staining textile fabrics; the cloth, whether of wool, silk, flax, or cotton, being first steeped in a suitable solution, then dried in the dark, and subsequently exposed to the action of light, those parts which are to form the pattern being protected by pieces of darkened paper, or some other suitable material, attached to a plate of glass. When the desired effect is produced, the time for which varies from two to twenty minutes, according to the nature of the process, the fabric has to be removed, in order to undergo a fixing operation, whilst a fresh portion of it is exposed to light. This may easily be effected by the use of very simple mechanical arrangements, so that a number of photographic printing engines may be placed side by side, and superintended by one person. From the trials which Mr. Smith has made, he believes that even the diffused light of a cloudy day will have power enough for the operation, though of course a longer time will be required for its perfection than on a bright and sunny day. In order to obtain a pale blue or white pattern upon a blue ground, Mr. Smith uses solutions of citrate, or tartrate of iron, and ferrocyanide of potassium; steeping the cloth subsequently in a dilute solution of sulphuric acid. Browns and buffs are obtained by using a solution of bichromate of potash; the excess of salt in the parts not acted on by light being afterwards either washed out, leaving those portions white, or decomposed by a salt of lead which forms a yellow chromate of lead. By combining these two processes with the use of madder, log-wood, and other dye stuffs, a great variety of tints may be obtained.

On 'Fire-arms, by Mr. Wilkinson.—In order to form some conception of the improvements lately proposed, and wholly or partially adopted, Mr. Wilkinson briefly alluded to the earliest fire-arms, which are still in use in India and various parts of the world. Commencing with the different modes of ignition, Mr. Wilkinson then proceeded to give a rapid sketch of the progressive steps by which fire-arms have arrived at their present state of comparative perfection. He described and exhibited, first, the matchlock, invented about the beginning of the sixteenth century: previous to which hand-guns were fired by a lighted match applied to the touch-hole in the same manner as to cannon. Second, the pyrites wheel-lock, introduced into this country about the time of Henry the Eighth, and continued to Charles the Second; in which ignition was obtained by the rapid revolution of a steel wheel against a pair of iron pyrites. Third, the flint lock, introduced about 1692, and generally used up to the close of the last war. Fourth, the percussion lock, invented by the Rev. Mr. Forsyth, and patented by him, April 11th, 1807, was generally introduced into our army in 1840. He then proceeded to explain the nature of the rifle, and the theory of projectiles, which was illustrated by diagrams. Mr. Wilkinson stated, that it has been calculated by French writers that with the old flint musket and spherical bullet during the last war, the maximum effect was only one in 3,000, either to kill or wound; and one in 10,000 was the minimum. So that, in some engagements 10,000 ball cartridges were expended to kill or wound one man; and a writer in the *Times* stated, a short time since, that 60,000 cartridges had been fired at the Cape, and only twenty-five Kaffirs killed. He observed, however, that this would not be the case in any future warfare; it will be much more destructive for the time, but of shorter duration. The percussion musket effected very little improvement in the accuracy or range of the bullet, but it produced much greater certainty of fire. It is wholly to the introduction of rifles and elongated projectiles that the recent improvements are due. We are told by Robins a century ago that this would be the case, but it generally requires a hundred years to convince any government. Mr. Wilkinson then gave a brief history of the changes in the form of the bullet introduced more than twenty years ago, by M. Delvigne, though suggested nearly a century since by Robins, who pointed out that the spherical form was not that best suited for projectiles. Lately the cylindrical-shaped bullet has attracted great attention from the ingenious modification of it invented by Capt. Minie, who added a small iron capsule to the lower end of the bullet. Lastly, Mr. Wilkinson described his own improved bullet, the form of which is *cylindro-ogivale* having two deep grooves round the base; and the novelty of which consists in the bullet being expanded in the act of discharging the rifle, although the bullet is perfectly solid. At the close of his paper, the author explained the electro magnetic chronoscope a mode of measuring the flight of projectiles invented by Prof. Wheatstone. The principle on which was effected, consisted in the interruption of an electric current, by the breaking of a fine wire, when the gun was fired, the circuit being again completed by another arrangement when the target was struck; whilst a clock, with suitable stop-hands, was employed to indicate the interval of time between the discharge and the blow on the target.—Mr. Varley, jun. inquired if Mr. Wilkinson's bullets were intended to be fired with any covering. He had found the Minie bullet more effectual with a covering than without. Mr. Wilkinson said, he preferred to use nothing but the naked powder and ball: the latter being rubbed with Russia tallow, or other grease, to fill the grooves. The pressure on the grooves squeezed out the grease, which lubricated the whole extent of the bore, and dimished friction; so that 100 rounds could be fired as easily as one. In reply to an objection to the use of grease in hot countries, Mr. W. stated that, with the thermometer at 130°, 100 rounds had been fired in thirty-six minutes; the barrel and other iron work being so hot that it could not be handled. The grease in that case was still used, but with the addition of about one-eighth of bees'-wax, which overcame the difficulty.

Improvement in Boring Operations.—From the *Miners' Journal*, published at Pottsville, Pennsylvania, we learn that an improved boring apparatus, patented by Mr. Knight, has been severely tested, by boring into the face of a granite rock 18 feet depth, and 24 feet in diameter, at the rate of 18 in. per hour. The framework of the machinery could not be properly fixed at first commencing the cutting, but when the excavating has entered about 50 feet, it will be connected by sleepers and braces, as firm as the rock which it is cutting out. The patented apparatus has been adopted by the North American Coal Company who are now employing it to be bore to a seam of bituminous coal, called the "Big White Ash Vein," which they expect to win at a, depth of about 50½ fms. The hole is 4½ in. diameter, which is drilled at the rate of 11 feet in five hours. The machine is so arranged that 10 drills can be worked in a certain space at one time by any motive power, and the *debris* is washed up by a curent of water from a pump worked by the same engine. Mr. T. S. Ridgway, mining engineer, of Minersville, states that during the winter of 1848 and spring of 1849 he had employed this machine in boring the Artesian well at East Boston for the Land Company, which worked well to a depth of 325 feet, but where not sufficient water was found, the stratum being a hard clay-slate, overlaying the primitive rock. The patentee is prepared, we understand to sink shafts to any depth, and in any strata, in half the usual time of those performed by hand labor, and at about one-third the expense. The operation of drilling through hard rock is one of considerable importance, and if this apparatus effects all the advantages which are claimed for it, the invention will prove of considerable value to the mining world.

History and Astronomy—In a paper read before the Royal Institution, by G. B Airy, Esq., Royal Astronomer, 'on the results of recent calculations on the Eclipse of Thales and Eclipses connected with it.' The Lecturer stated, that the conclusion as to the general fitness of the eclipse of B. C. 585 for representing the circumstances of the eclipse of Thales, by inference from modern elements of calculation, was first published by Mr. Hind in the *Athenæum*; and he said, that he had examined in greater or less detail every eclipse from B. C. 630 to B. C. 580, and that no other eclipse could pass over Asia Minor,—and gave it as his opinion that the date B. C 585 was now established for the eclipse of Thales beyond the possibility of a doubt.

THE CANADIAN JOURNAL.

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labor, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal;* and an acquaintance with the improvement in Art and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds; nothing more being required of the Members of the Canadian Institute than the means the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, MAY, 1853.

CONTENTS:

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FOR THE

COUNCIL OF THE CANADIAN INSTITUTE,

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All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

12.

EXPLANATION

The Railway Approach to be on the same level as t
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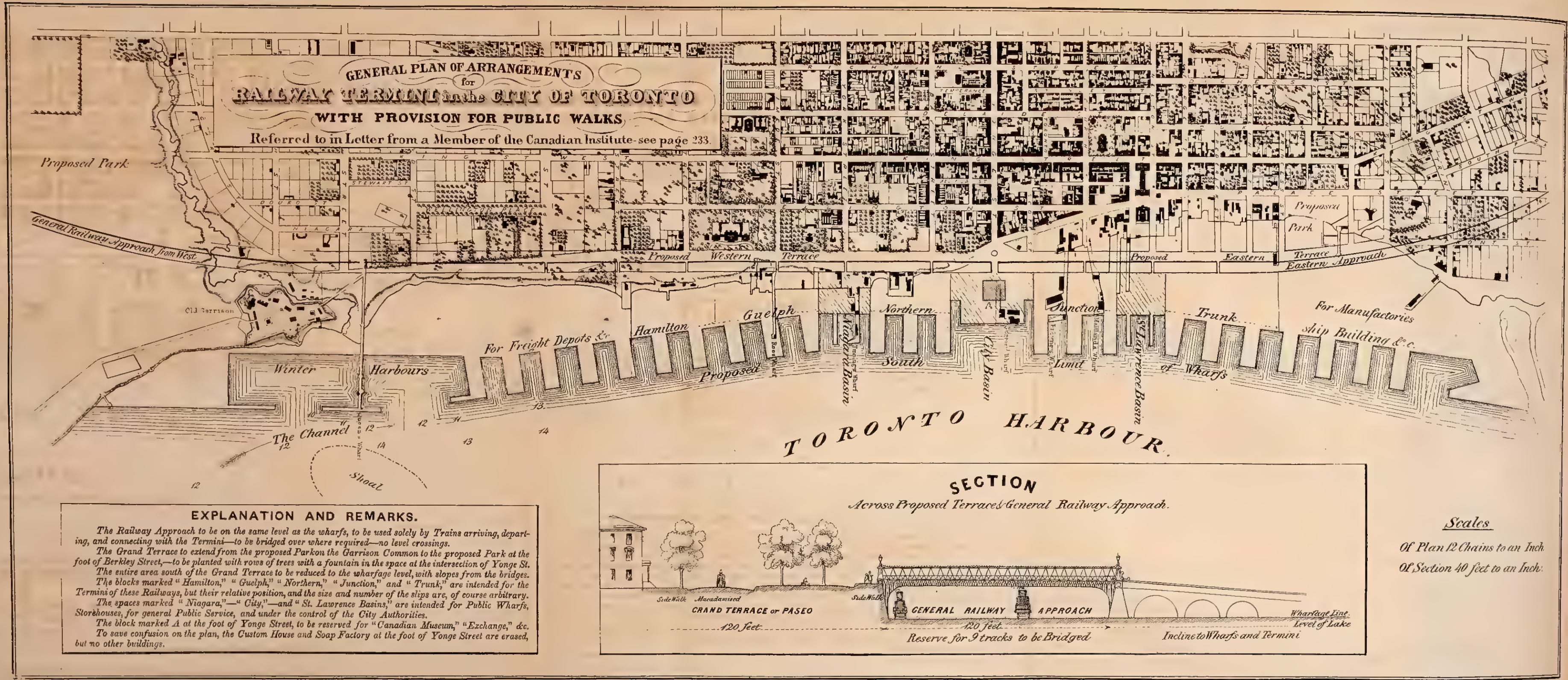
The Grand Terrace to extend from the proposed Pa
foot of Berkley Street,—to be planted with rows of trees wi
The entire area south of the Grand Terrace to be rea
The blocks marked " Hamilton," " Guelph," " North
Termini of these Railways, but their relative position, and t
The spaces marked " Niagara,"—" City,"—and " S
Storehouses, for general Public Service, and under the co
The block marked A at the foot of Yonge Street, to
To save confusion on the plan, the Custom House an
but no other buildings.

D U C H E S S S T
D U K E S T
P A L A C E S T R E E T
F R O N T S T
Proposed Park.
Proposed Eastern Terrace
Eastern Approach.
Junction
Trunk
For Manufactories ship Building &c.
Limit of Wharfs
Maitland's Wharf
St Lawrence Basin
R B O U R.
Railway Approach.
PPROACH.
Wharfage Line.
Level of Lake.
Bridged
Incline to Wharfs and Termini
Scales
Of Plan 12 Chains to an Inch.
Of Section 40 feet to an Inch.


GENERAL PLAN OF ARRANGEMENTS
for
RAILWAY TERMINI in the CITY OF TORONTO
WITH PROVISION FOR PUBLIC WALKS
Referred to in Letter from a Member of the Canadian Institute - see page 233.
Proposed Park
General Railway Approach from West
Proposed Western Terrace
Proposed Eastern Terrace
Eastern Approach
Proposed Park
Old Garrison
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Hamilton
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Northern
Junction
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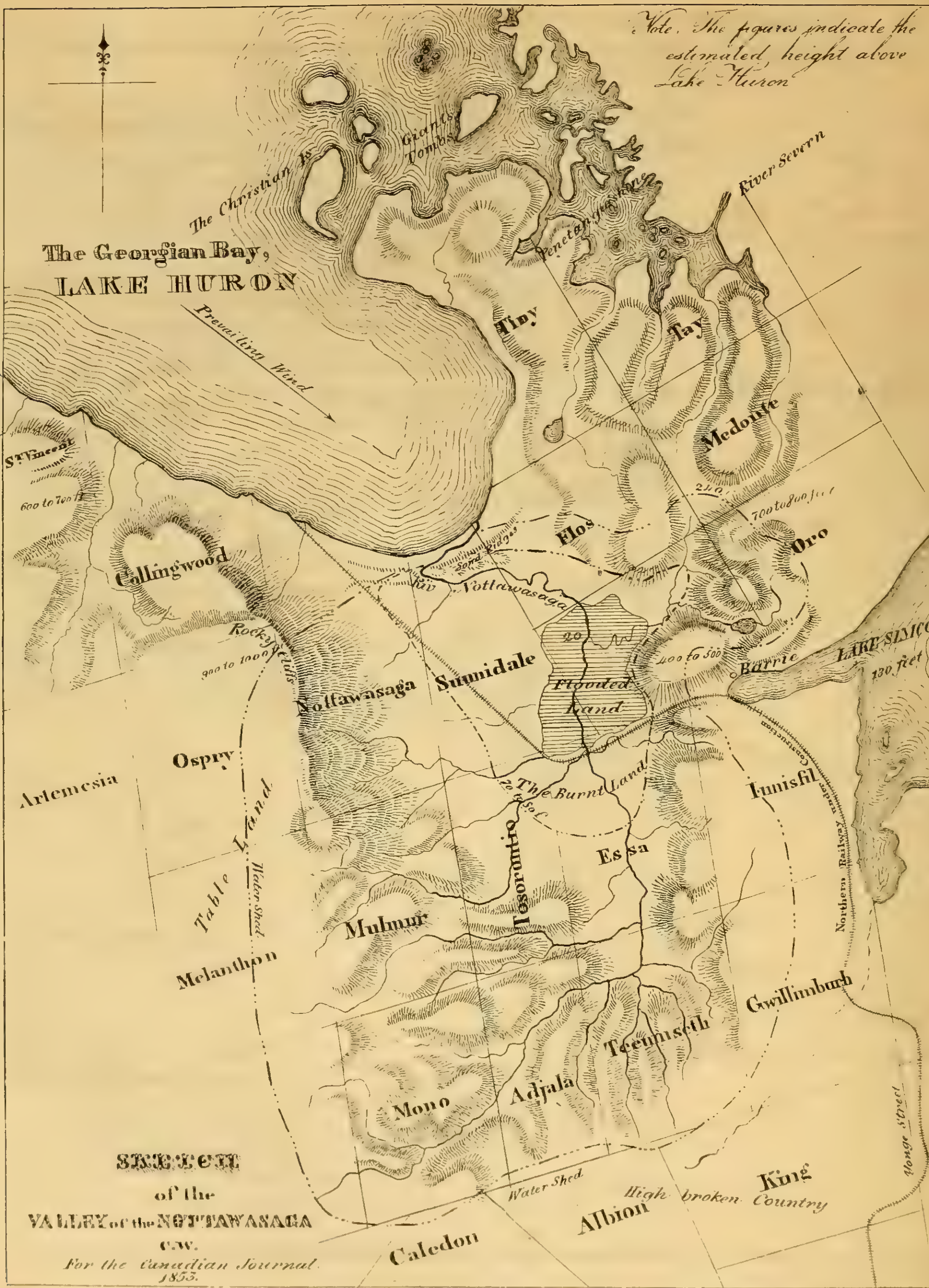
For Manufactories
Ship Building &c.
Winter Harbours
Proposed South Limit of Wharfs
Niagara Basin
City Basin
St. Lawrence Basin
The Channel
Shoal
TORONTO HARBOUR.
EXPLANATION AND REMARKS.
The Railway Approach to be on the same level as the wharfs, to be used solely by Trains arriving, departing, and connecting with the Termini—to be bridged over where required—no level crossings.
The Grand Terrace to extend from the proposed Park on the Garrison Common to the proposed Park at the foot of Berkley Street,—to be planted with rows of trees with a fountain in the space at the intersection of Yonge St.
The entire area south of the Grand Terrace to be reduced to the wharfage level, with slopes from the bridges.
The blocks marked "Hamilton," "Guelph," "Northern," "Junction," and "Trunk," are intended for the Termini of these Railways, but their relative position, and the size and number of the slips are, of course arbitrary.
The spaces marked "Niagara,"—"City,"—and "St. Lawrence Basins," are intended for Public Wharfs, Storehouses, for general Public Service, and under the control of the City Authorities.
The block marked A at the foot of Yonge Street, to be reserved for "Canadian Museum," "Exchange," &c.
To save confusion on the plan, the Custom House and Soap Factory at the foot of Yonge Street are erased, but no other buildings.
SECTION
Across Proposed Terrace & General Railway Approach.
Side Walk
Macadamised
GRAND TERRACE or PASEO
Side Walk
GENERAL RAILWAY APPROACH
120 feet
120 feet
Reserve for 9 tracks to be Bridged
Incline to Wharfs and Termini
Wharfage Line
Level of Lake
Scales
Of Plan 12 Chains to an Inch
Of Section 40 feet to an Inch



See Page 223.

Hugh Scobie Lith Toronto.

The Canadian Journal.

TORONTO, MAY, 1853.

Address Delivered at the Annual Conversazione of the Canadian Institute, April 2nd, by Mr. Justice Draper.

MR. PRESIDENT AND GENTLEMEN,—

Our Annual Conversazione unites with the other signs of the times, to remind us that Spring is at length emerging from the icy thraldom of Winter, that the season of opening leaves and blossoming buds is just arriving. May we not, without forced analogy, trace the signs of the same spring time of the year, as applied to the state and condition of Upper Canada.

The few posts, whether military or trading, or even those of the earliest missionaries, which were established in any part of what was afterwards declared to be Upper Canada, before the peace of 1783, were too inconsiderable to require notice as forming any exception to the general proposition, that this part of Canada was then a mere wilderness, in which civilization was at Zero, and into the gloomy depths of whose primæval forests, neither the light of Science nor the radiance of Christianity had penetrated. It was after that period that the settlement of Upper Canada was begun by that loyal and devoted body of people, of whom Edmund Burke spoke as "persons who had emigrated from the United States," "who had fled from the blessings of the American Government," and with regard to whom he further observed: "there might be many causes of emigration not connected with government, such as a more fertile soil, or more congenial climate—but they had forsaken all the advantages of a more fertile soil, and more southern latitude, for the bleak and barren regions of Canada." It is to them and to their enduring efforts that this country owes its first germ of improvement. And let it be borne in mind, that they were not of a class who emigrated from the mere pressure of want, or to escape the danger of starvation—whose principal craving was to find such employment of their physical energies, that in return for their labour, they should obtain food for themselves and their little ones. They had been accustomed to the most valuable enjoyments of civilized life, to the advantages of Education and Christian teaching, and they sought in Upper Canada a home, where, in the course of years, their unremitting and fearless toil might realise for them those advantages,—which their attachment to their Sovereign, and to British institutions, had caused them to abandon. Their numbers were increased, and their exertions aided by the partial influx of other emigrants, among whom, in time, came the well-known Glengarry Highlanders, and they soon wrought a change. The luxuriant bounty of nature, as exhibited in a fertile soil, and a not unfavourable climate, was appropriated to the use of man; lands hitherto occupied by primæval forests were cultivated, schools and churches were built, and those who had struggled through the privations and hardships of the winter began to look with confident hope for the enjoyment of the spring time of this young and rising Country.

The war of 1812, however, checked for a time the progress which had been so favourably begun, and while in some respects it gave an unnatural impulse to development, it was exhausting the vital energy, so that when peace was restored, it became apparent, that if there had been no retrogression, there had been at all events little, if there was any, advance. This check was, however, but temporary. Those exertions, which for the time had been devoted to other, and in some instances, sterner pursuits, were soon restored to their proper channels, and became devoted to the improvement and development of the country. The unemployed inhabitants of the British Isles began to arrive in hundreds and thousands, to unite in the task of turning the wilderness into a smiling field; the population of Upper Canada, which, in 1791, was estimated at ten thousand, in 1824 exceeded 150,000; and in 1837, was increased to 375,000; and the observations, long before made in the House of Commons, with respect to the thirteen old Colonies, might have, with full force, applied to Upper Canada:—"Such is the strength with which population shoots in that part of the world, that state the numbers as high as we will, whilst the dispute continues, the exaggeration ends. Your children do not grow faster, from infancy to manhood, than they spread from families to communities, and from villages to nations."

In the full tide of this prosperity, however, there came another check—of no long duration fortunately—though of painful character—to which I allude only as forming a part of that truthful picture, which I am endeavouring to exhibit before you. This, as well as the war of 1812, may (in strict adherence to that analogy with which I set out) be compared to those tempests of the vernal equinox, which, though disastrous in their immediate consequences, whether to individuals or to localities, are ordered or permitted by an all-wise and overruling Providence, in furtherance of its general and beneficent designs, and now that they are passed over, and calm is restored—now that the sufferings they caused are removed or alleviated—may we not indulge ourselves in the application of the poetical imagery of Soloman:—"The winter is past—the rain is over and gone—the flowers appear on the earth—the time of the singing of birds is come, and the voice of the turtle is heard in our land."

But the song of rejoicing would lose half its power and beauty if its application were confined by us to the consideration of advancement in material prosperity alone. It is not only foreign to my present purpose, but it would occupy far more than the limited time I mean to detain you, were I to attempt even an outline of the various efforts made for public education, for intellectual, moral and Christian cultivation. It is not, however, the least significant proof of the success of those efforts that they have created and fostered an earnest longing for more extended knowledge—a desire which exhibits itself at different times, and, among other ways, in the attempts to establish societies or institutions to assist in scientific research—in intellectual development. Such was the literary and philosophical society formed more than twenty years ago by the exertions of the eccentric but talented Dr. Dunlop, and which was followed afterwards by the City of Toronto Literary Club, and the City of Toronto Ethical and Literary Society—both formed in 1836—all which, with perhaps some others I might more particularly mention, seem to have been put forth a little too prematurely, and, like precocious blossoms, to have been nipped, and to have perished without reaching any maturity. Such is—may it flourish and take deep root—the Canadian Institute, established, as you well know, principally for the purpose of promoting the physical sciences—for encouraging and advancing the industrial arts and manufactures—an establishment which I am well assured we all regard as one of the fairest promises of our spring, and to the unfolding of whose blossoms, and the perfection and maturity of whose flowers and fruit we cannot but feel it a duty—one well rewarded in its own accomplishment—to contribute our best exertions.

Among other advantages to which I look forward with great confidence as the result of the success of the Institute, is the attention it is likely to attract to this Province, and the consequent

diffusion of more correct ideas—of more accurate knowledge of it, especially in the mother country. Conscious, as we may well be, of our growing strength and rapid advancement, it is, nevertheless, true and, perhaps, a little mortifying, to find much misapprehension—I had almost said ignorance—respecting even the very geography of the Province, existing in England. Were this confined to the less educated classes we should not so much wonder, and were the instance of it of an early date, and before correct information was easily attainably, we should not have any right to complain; but the fact is otherwise, as two instances I shall select will abundantly show. Half a century had elapsed from the time that Burke spoke of the "bleak and barren regions of Canada," before the publication of the last volume of that highly esteemed and valuable work, Alison's History of Europe, and from that volume I make the following extract:—"The first operations of the campaign in Canada proved singularly unfortunate to the Americans. In the end of January, Gen. Winchester with a thousand men, crossed over to attack Fort Detroit, in the Upper Province, and before any force could be assembled to resist him, made himself master of French Town, twenty-six miles from that place. General Proctor, however, who commanded the British forces in that quarter, no sooner heard of this irruption than he hastily assembled a body of 500 regulars and militia, being the Glengarry Fencibles, and 600 Indians, and commenced an attack upon the invaders two days afterwards in the fort of Ogdensburgh." To those acquainted with the events alluded to, or with the places mentioned, it is unnecessary to point out the errors which this passage contains. To some it may be useful to explain that General Winchester's advance upon Detroit was made in the (now) State of Michigan, which, though at that moment in the British possession, was nevertheless American territory,—that Fort Detroit, not long before captured by Sir Isaac Brock, is in Michigan, on the same side of the river—which there forms the boundary of Upper Canada—as General Winchester was marching on,—that Fort Detroit is nearly at the western extremity of Lake Erie, in which part of the country Colonel Proctor then commanded the British forces,—while the attack in which the Glengarry Fencibles bore so distinguished a part, and which resulted in the capture of the American position at Ogdensburg, was under the command of a different officer,—and that Ogdensburg is situated on the river St. Lawrence, at a distance exceeding the whole length of both Lakes Erie and Ontario from the scene of General Winchester's capture. A reference to the Annual Register for 1813, which is cited in the work as the authority for this passage, shows clearly enough that this error has arisen from blending into one, as if relating to the same events, two entirely distinct transactions, and, no doubt, rests with some transcriber employed by this eloquent and usually accurate historian.

Again, in another work, the second edition of which was published as late as 1845, by a gentleman who now holds the rank of Queen's Counsel, and whose pen has acquired for him a deserved reputation in works founded on other than professional subjects. The following passage occurs:—"Thus the waters which might at first have been seen forming part of the magnificent confluence of Niagara, and then precipitated amid clouds of mist and foam down its tremendous falls, and after passing over great tracts of country through innumerable channels and rivulets, serve at length quietly to turn the peasant's mill." A passage which, however well written, is nevertheless, a complete inversion of the facts since the waters which are precipitated over the Falls of Niagara flow onward, gathering as they go through Lake Ontario and the River St. Lawrence, the additions of many a tributary stream, but never diverge into any other channel in their downward course, until they expand into the Gulph and become mingled in the wide Atlantic waves.

It would be easy, especially if account was taken of the mistaken ideas respecting Canada, of individuals of less standing and pretension, to multiply such instances, but enough has been said to shew the necessity of diffusing more accurate information as a corrective of the past, and as a means of prevention for the future.

I cannot quit the subject without availing myself of this fitting occasion to express what I am sure is equally felt by all present. My sense of the obligations we owe to our President for his active exertions in support of, and his valuable contributions to the proceedings of the Canadian Institute. In leaving Upper Canada, he will, I am certain, carry with him our best wishes for his happiness and prosperity, not unaccompanied with the hope that we may be able at some future period to welcome his return among us, and to benefit by the renewal of his co-operation in the proceedings of the Society. Convinced of the excellence of the objects of the Canadian Institute, I rejoice at its present success and its future prospects. A diligent pursuit after, and a fitting employment of knowledge when gained, cannot fail to exercise an elevating influence in our relations to each other, and to lead to just conceptions of our respective duties in the various walks of life. We shall more practically feel that it is not for ourselves only, but for our fellows, that we are called upon to think and act, while we strive for our individual improvement. We shall strive also to communicate to others the benefit of what we attain, thus approximating the lofty character of those who,

> "With God himself
> Hold converse, grow familiar day by day,
> With his conceptions, act upon his plan,
> And form to his the relish of our souls."

On the Poisonous Plants which are indigenous to, or which have become naturalized, in the neighbourhood of Toronto, by Edward M. Hodder, M. C., & M. R. C. S., Professor of Obstetrics, &c., in the University of Trinity College.

(*Continued from Page 204.*)

(*Read at the Annual Conversazione of the Canadian Institute.*)

17th. Lobelia Inflata............Indian Tobacco.
Class Pentandria..........Order Monogynia.

This pretty plant varies in height from six inches to two or three feet.

The stem is erect, angular and hairy; the leaves scattered, oval, sinuate, veined and hairy. The flowers in spikes, corolla bluish purple, the tube prismatic and cleft above, the segments spreading, two above lanceolate, the three lower ones oval.

The whole plant operates as a violent emetic.

The last three plants are exceedingly pungent to the taste, and in large doses are narcotico acrid poisons. It is said that in teaspoonful doses of the powder, they have proved fatal in five hours, where vomiting has not been produced. When chewed incautiously, they produce an insupportable sense of burning and distension, which extends down the gullet; nausea ensues, and vomiting generally follows, accompanied with oppressive prostration, languor of the pulse, and sweating.

Their acrid taste and emetic qualities, however, prove their safeguard; for, it is impossible to eat the plants in sufficient quantities to produce death, and which can only be occasioned by an extreme dose taken by mistake.

18th. Dracontium Fœtidum, or Setodes Fœtidus. } Skunk Cabbage.
Class IV.............Order I.

This is a strong-scented, repulsive plant, exceedingly meritorious of the name it bears.

The root is large and abrupt, with numerous, crowded, fleshy fibres. The spathe or flower which emerges from the ground some time before the leaves, is ovate, swelling, spotted, and sometimes nearly covered with dull brownish purple. The leaves make their appearance after the flowers; they are numerous, large, and crowded, oblong, heart-shaped, acute, smooth, with numerous veins of a paler colour. They continue to increase in size for a month or two after the flowering period is over, and are conspicuous in summer in every meadow, swamp or brook.

The odour depends on a volatile principle, not separable by distillation, besides which there is an acrid principle, which remains in the root when dried, and to which the plant owes its dangerous qualities when taken in over doses.

19th. Hyosciamus Niger.—Henbane. Class V. Order I., Nat. Ord. Luridæ.

This plant is not indigenous to this country, but within the last five or six years is has become naturalized in the immediate neighbourhood of this city, the only place where I have as yet found it, is on Front Street, near the Bay, and to the westward of Simcoe Street.

It belongs to the poisonous Nat. Order Luridæ, and like most of them, equally useful in medicine.

The whole plant has a glaucous or sea green colour, is hiary and viscid, and emits a rank and offensive smell.

The first leaves spread on the ground, and have some resemblance to a young thistle. The flowers are funnel shaped, irregular, with five spreading, obtuse segments, of a pale yellow or straw colour, with a beautiful network of purple veins. They are followed by a row of capsules, two celled, and covered with a lid—which is invested by its rigid prickly and persistent calyx.

The Medicinal as well as the poisonous effects of this plant are too well known to require any comment from me, particularly as the lurid aspect and the nauseous smell would in all probability ever prevent its been eaten in its natural state.

I have now, as briefly as I could, given a description of most, if not all, the noxious or poisonous plants growing near this City; yet, I should consider the list incomplete, were I to omit the mention of one which, although not generally looked upon as a poison, yet, I believe it to be the cause of more deaths in the human family than all the others put together. I mean the Secale Cornutum, or Ergot of Rye.

A good deal of uncertainty prevails as to the exact nature of this substance;—it is generally thought to arise under the influence of undue moisture, damp soils, and a rainy or misty atmosphere, especially at the time the ear is coming into flower.

The Ergot or Spur will, occasionally, in unfavourable seasons, affect all the Graminacæa, more rarely the Cyperacæ, and sometimes even the Palms; but it is found much more frequently, and of larger size, in rye.

Its action on the animal economy is very peculiar, and the most remarkable of these effects are those produced by its free and long continued use with the food.

Amongst cattle, it has frequently been known to produce 'black foot' and 'rot;' in other instances a cachectic state of the system has been observed, indicated by 'extreme wasting and weakness, loss of appetite, frequent pulse, fetor of the secretions and excretions, contraction of the spleen, and enlargement of the liver.' I had an admirable opportunity of observing these effects some years ago, where a large and good stock of cattle, horses, and sheep, were wintered on the straw of rye, some of which was *slightly* diseased.

In the spring of the year, the whole of the stock, without a single exception, was in the most abject state of misery; although the winter had been short and not severe, and the cows and sheep well fed with hay, the barn-yard was always kept covered with the rye straw, at which the cattle were constantly picking. The result was the loss of about $\frac{1}{4}$ of the sheep, and $\frac{2}{3}$ of the lambs; and both the cows and sheep brought forth their young prematurely.

In the human race two distinct diseases have been referred to its protracted use, and both of them have been observed to prevail as epidemics in various parts of the Continent, where rye constitutes a considerable proportion of the food of man.

One of these diseases, termed Convulsive Ergotism, is distinguished by the characters of an acute comatose affection, giddiness, dimness of vision, insensibility, convulsions, imperceptible pulse, and death within two days.

The other, and more common disorder, termed Gangrenous Ergotism, which commences with weariness, fever, a tendency to hemorrhage, pains in the arms and limbs, and at length dry gangrene, commencing in the fingers or toes, which drop off by the joints, and the patient either recovers slowly, or expires, worn out under the process of repair.

When given in single and large doses its effects are different, and it does not appear to be an active poison, as it required three ounces to kill a dog; and in man one ounce has only occasioned vomiting, colicy pains, headache and stupor.

It is, however, for a criminal purpose that this substance is most frequently made use of; from its well known action upon the womb, it is very often had recourse to for the purpose of procuring abortion; and I am convinced that, viewing it in this light, it is without doubt the cause of more infantile deaths than the whole of the other poisons put together.—*Here Dr. H. gave a short account of a visit he paid to the Rice Lake Indians; and spoke of their medicines, superstitions, cause of their great decrease amongst the Christian Tribes. 1st. Abortion very common; 2nd. spirits; 3rd. want of proper food.*

I feel, gentlemen, that I have trespassed too long upon your kind indulgence, and wearied you with details in which many can have felt but little interest.

It was my wish to have offered a few remarks on the advantages to be derived from the study of Natural History; but I find that I have already far exceeded the time allotted to me. It is to be hoped, however, that the time is not far distant when instruction on this subject shall occupy its true place, and receive its due share of attention in all our schools and seminaries of learning.

The celebrated Linnæus, in his 'Reflections on the Study of Nature,' observes:—'He who does not make himself acquainted with God from the consideration of nature, will scarcely acquire knowledge of Him from any other source; for, if we have no faith in the things which are seen, how should we believe those things which are not seen?'

On Accidental Discoveries.

Read at the Annual Conversazione of the Canadian Institute, April 2, 1853, *by* HENRY SCADDING, D. D., CANTAB., *First Classical Master of Upper Canada College.*

(*Continued from Page* 207.)

Sir Francis Palegrave in his "Merchant and Friar," amusingly represent the good Abbot as scouting the idea that the *shape* had anything to do with the marvellous effect which a certain lens was discovered to have on the vision of the short-sighted young Emperor. According to the notion of the age, it was simply the innate *virtus* of the transparent gem of which the lens was composed that produced the result.

The defect of sight arising from the approach of old age, calls of course, as we all know, for a lens of the reverse shape of that required by the short-sighted. The construction of such a lens may readily have been suggested by noticing the magnifying power of a drop of water, or a globule of clear glass. A lens of this description once made, and used in frames for the correction of vision, soon led to important combinations.

An ingenious lad—the son of a spectacle-maker at Middleburgh in Holland—takes it into his head to look through two of these convex lenses at once, varying the distance between them by means of his two hands. He observes that the vane on the church steeple is brought wonderfully close to his eye—but that the image seen is reversed. The casual circumstance gives birth to a noble progeny of inventions. Here is the rudimental germ of the Telescope, the Microscope, the Cameras for various purposes.

When Lawrence Koster, at Haarlem in 1430, let fall on a piece of paper the fragment of beech bark on which he had playfully cut in relief the initials of his name, little dreamed he as the stain produced by the moist sap first attracted his attention, what a revelation had been made to him, and through him to the world. Metal types and the art of printing thus had their beginning.

Bradley, the celebrated astronomer, (1748), is amusing himself with sailing on the Thames in a pleasure boat: the wind is blowing strongly; frequent tacks are made; he notices that at every turn of the boat, the vane at the mast-head, instead of keeping steadily in the direction of the wind, exhibits an uncertain sort of motion. By a train of reasoning he arrives at an important conclusion on the subject of the aberration of light, starting a theory that has relieved astronomers from a perplexity under which they had previously laboured.

M. Malus, a French Colonel of Engineers, (1810), casually turning about in his hand a double refracting prism, as the sun is setting, observes one of the images of a window in the Palace of the Luxembourg disappear—and it leads him to the discovery which has rendered his name distinguished, of the polarization of light by reflection.

We might narrate how friction on amber originated the science and name of electricity—how experiments with jet, with sealing wax and India Rubber, might lead to the same result—how Louis Galvani, (1737) at Bologna, by taking notice of the spasmodic action of the legs of dead frogs when touched by his electrically-charged scalpel, discovered that phase of electric science that retains his name—how Masso Finiguerra, (1450) at Florence, while working at his business as an annealer of gold and silver, discovered the art of engraving on copper-plates, so as to obtain impressions on paper therefrom—how Louis Von Liegen, (1643,)—or, as some say, Prince Rupert—invented the process of mezzotint, by observing the corrosion of rust on a gun-barrel—how Alonzo Barba at Potosi, (1640,) happening to mix some powdered silver ore with quicksilver—with the view of fixing, if possible, the latter substance—found all the pure silver of the ore absorbed by the quicksilver, and so arrived at the secret of forming amalgams—how the casual observation of Francis Joseph Gall, (1757,) while yet a boy at school—to the effect that those of his companions who had prominent eyes had facility in remembering words—led at last to his curious theory of phrenology—how M. Argand, by perceiving a draught created by the passing of the neck of a broken bottle over a flame, was led to invent the well-known Argand Lamp—how M. de Courtois, (1813,) by accident detected iodine in sea-weed, from which material, since his time, it has been extensively manufactured.

These, and other equally interesting examples of happy discoveries by accident, I might narrate at length; but, I hasten to speak of the steam-engine, whose history presents us with several anecdotes in point. With these I shall conclude.

And first, the Marquis of Worcester, [1650,] while a political prisoner in the Tower, conceives from the dancing motion of the cover of the vessel in which he is cooking his dinner, the idea of a piston driven by steam—an idea that results at last in the perfect engine of James Watt.

Then, Capt. Savery, (1680,) flings into the fire a wine-flask from which he has just removed the contents; he perceives that steam is generated by a few drops which remain in it. Something prompts him at this moment to snatch it from the fire, and to plunge its neck into a bowl of water; the water rushes up into the body of the flask, a partial vacuum having been created therein. This leads him to the construction of the engine known by his name, useful for raising water from small depths.

Again, up to the time of Newcomen, (1705,) the condensation of the steam within the cylinder was effected by the external application of cold water. He observes on one occasion that the piston continued its movements after the external application had ceased; and the cause of this he finds to be a jet of water entering the cylinder through a small aperture which had escaped his notice. A well-known simplification of the engine is the consequence.

Lastly, the boy Humphrey Potter, set to open and shut the steam-valves, contrives by means of strings to make the working beam supply his place; thus originating arrangements by which the beam is made to execute several secondary offices.

The discoveries to which I have alluded, I have spoken of as accidental. This is a phraseology which we rather unreflectingly employ. Doubtless, all the capabilities of things—the agreeable as well as the useful—are intentional. They have existed from the beginning, and have been designed for the good of men; and when an individual is so fortunate as to detect any one of them, he is simply fulfilling the Divine will.

On looking back over history, I think too we can discern, in the case of several important discoveries at least, that the moment of their occurrence has not been utterly accidental. When the mariner's compass was invented, it was soon to be required. Columbus, Vasco de Gama and Cabot lived in the next age. When Lawrence Koster saw his initials impressed on paper from the piece of beech-bark, the intellect of the fifteenth century was heaving, fermenting—struggling for some means of embodying and circulating its aspirations, more rapid, more universal than the reed of the solitary scribe.

The disclosure of the continent of America itself, had it no connexion at the time with the approaching overburdened condition of the populations of the old world, with its social theories becoming obsolete and requiring a free field in which to be re-constructed?

If such a view of events be well-grounded, what are we to think of the present age? Is the curious accumulation of wonders, in the midst of which we find ourselves, accidental? Are the facilities for intercommunication among our fellow-men, accidental? Is the abundance of gold, accidental? Is the perfection to which the arts—the certainty to which the sciences—are so rapidly tending, accidental? If not, there are signs enough to invest this age with an enormous amount of interest—nay, with a degree of solemnity. For, what are our *duties* in such an age? Surely our responsibilities are greater than those of our forefathers. The facilities which we enjoy—the powers which we are enabled to exert—were not intended to be mere toys for our amusement: are we not expected to work out with them results which shall in some degree be proportionate to the trust?

An era of great importance is just opening upon ourselves. We are beginning to feel that the wave of the world's movement has reached us, and that we are being lifted forwards on its tide. Our opportunity has arrived; we shall, I doubt not, embrace it with energy.

It is in such times, in most countries, that ideas of sterling value are struck out. We may expect to see an intellectual activity among ourselves surpassing any that has as yet characterized us. One remark it will be useful to add. In every instance which I have adduced of what I have called "accidental discoveries," the accident was such as would be very unlikely to occur to an unobservant, unthinking, badly-informed person. The more observant—the more thoughtful—the more completely informed we are—each in our several professions—the more likely we may be sure, we shall be, to light on ideas that will be of practical advantage to the world.

Let each man stand, then, judiciously on the watch, and challenge every phenomenon with intelligence. Nature is not exhausted; there are yet latent secrets within her stores. Clues to additional truths are floating about in the air above, in the water beneath; let but the observer come who has the eye to see, the hand to lay hold of them. In arrangements already established, there are combinations and simplifications possible, which may eclipse the original inventions on which they are founded.

All countries have contributed names to the list of those who have made posterity mindful of them for services rendered in science and the arts. From the omens of her existing history, we cannot doubt but that Canada will contribute names to that list. In what direction will the first great manifestation be amongst us? Will it be in the mill, or the loom, or the plough? In the canal or the railway? In the modes of navigation on lake and river? In the purifying and working of the metals? Will it be in the department of the chemist, the anatomist, the therapeutist? Or will it be in the shape of literature and metaphysical speculation?

Our country has a wreath ready for each one of her sons who shall give to the question a practical response.

Note on Fossils from the Ottawa River; by J. W. Salter, F.G.S., A.L.S.—(*See Canadian Journal for January.*)

Lower Silurian.—The fossils from the S.E. end of Allumette Islands, on the Ottawa River, are the only Lower Silurian fossils yet examined of Mr. Logan's large collections, and they bear out well the opinion he has expressed, that in some parts of Canada but one calcareous group can be distinguished between the Potsdam sandstone below, and the Hudson River group above, agreeing in the main with the celebrated "Trenton limestone" of New York, but possessing also many of the fossils characteristic of the lower limestones which in that country have received separate names.

For instance, one of the most abundant fossils is a species of *Scalites (Euomphalus uniangulatus)*, described as a fossil of the calciferous sand-rock by Hall. The corals, again, *Stromatocerium rugosum*, *Columnaria alveolata*, which are very abundant, are those of the Bird's-eye and Black River limestones.—The former of these corals, too, is usually found investing (after the manner of a sponge) a large and fine species of *Maclurea*, a genus of gasteropods which in New York does not mount above the "Chazy" or lowest limestone, and is there abundant. Hall indeed expressly mentions that the *Stromatocerium* occurs in beds above those which contain the *Maclurea*. In this case, however, the parasitic zoophyte has generally selected this fine and new shell, to which I propose giving the name of its discoverer. It is well distinguished from *M. magna*, by the much more rapid increase in diameter of its whorls and its minute umbilicus. It is possessed moreover of a most peculiar operculum, which will at once establish the right of *Maclurea* to rank as a distinct genus, being furnished within with a broad and strong bony process for the muscular attachment, and being itself very strong and massive. Prof. Forbes has undertaken to compare this peculiar operculum with that of some rare living gasteropods of far inferior size, so that more need not be said of it at present.

The *Stromatocerium* affects also a small and new species of *Scalites* allied to the one above-mentioned, and frequently covers all but the mouth, so as to mask the form of the shell completely.

But it is with the Trenton limestone that the greater number of species agrees; and while a large portion of them, especially the gasteropods, appear to be undescribed in Hall's work, still the analogies are very evident. A list of ten or more *Murchisoniæ* or *Pleurotomariæ* affords one, *M. ventricosa*, characteristic of the Bird's-eye limestone; two common in the Trenton limestone, *M. bicincta* and *M. gracilis* (very abundant species), and *M. bellicincta*, Hall, a large *Turritella*-like form; the rest seem to be new; and some of them are remarkable for the tendency of the whorls to separate and become what may be called vagrant, as happens in some accidental varieties of the common snail. The shells are tolerably thick and strong.

Some smooth shells, exactly like the *Euomphali* of the carboniferous limestone, and several roughly sculptured *Turbines* or shells of apparently allied genera, occur; and one exceedingly elegant, with close thread-like lines of growth, is very common. *Holopea* of Hall, an ill-defined genus, offers one or two species of the typical form, and one closely allied to *H. bilix* of the Western States. There are three species of *Scalites*, a genus with the mouth notched like *Pleurotomaria*, but destitute of a spiral band; one is the small species so commonly encrusted over; a second, of which we have but a single specimen, is muricated with spines, like a *Delphinula*; the third is the very common *S. (Euomphalus) uniangulatus* above mentioned, which also, but rarely, shows a tendency to become spinose. There are also two or three species of the genus *Raphistoma*, which appears to be only a discoid form of *Scalites*. We have a *Turritella?* spirally ribbed, and undistinguishable in general form from living species. But the most abundant and characteristic shell is the *Maclurea*, fragments of which, with scattered opercula, occur on almost every surface.

Among bivalve shells, which chiefly belong to the *Arcacidæ*, a very interesting new genus has rewarded examination. It was found that two species resembling *Nucula* in every general character, differed from it importantly by having no internal ligament, but a very manifest exterior one; one of these species measures three inches across, and from the general analogy of several accompanying species it is believed that this form will be found common in the Silurian rocks, and will include many species now referred to *Nucula*. It might be called *Ctenodonta*. Of the same family also, a *Lyrodesma* (a genus with radiating teeth beneath the beak and synonymous with *Actinodonta*, Phillips) is closely allied to a Trenton limestone species. There is a new genus probably belonging to the *Arcacidæ*, but only possessing two or three anterior teeth; but the collection does not include any *Aviculæ*, or indeed any other of the usual Silurian genera of this order, and of the seven or eight lamellibranchiate shells none appear quite identical with those from New York; but, as might be expected, the common *Brachiopoda* of this locality are those most abundant also in the Trenton limestone. *Orthis tricenaria*, Conrad, swarms here, as does also *Leptæna filitexta*, Hall, a shell very like the common *L. alternata* of the Trenton limestone, but reversed as to the convexity of the respective valves. But the latter shell, so abundant in New York, does not occur here at all. *Atrypa hemiplicata*, Hall, and *A. increbrescens* are tolerably frequent; and there are two or three other species of *Orthis*, and some small plaited and smooth *Terebratulæ*, which require further examination.

The *Bellerophons*, two of which are probably identical with New York species, are those of the lowest or chazy limestone, namely, *B. (Bucania) sulcatina*, Emmons, and *B. rotundata*, Hall. The group to which these two belong is that of which the English *B. dilatatus* is a familiar type, the whorls scarcely enveloping each other, and the mouth wide and trumpet shaped.

There is however a true *Bellerophon* so like *B. obtectus*, Phill., from the Ludlow rocks of Pembrokeshire, that, but for its treble size, it might be taken for it.

Perhaps one of the most interesting of the mollusks is a large *Cleodora*, quite new to America, and not yet described as such from Britain. On attentively comparing the American, Irish and North Welsh specimens of this fine shell, which measures two inches across, I can find only trivial variations. It does not require a new specific name, having been figured from an imperfect specimen as *Atrypa transversa* by Portlock. It is interesting to find this species (which of course, as a Pteropod, had ready means of migration) in the two countries. There are but few other species identical with those of Great Britain, but I think I recognise *Turbo trochleatus*, and perhaps *T. tritorquatus*, McCoy, as common to the two regions.

Of the Cephalopoda, the remarkable two-edged *Orthoceras*, called *Gonioceras anceps* by Hall, is a Black River limestone species. *Cyrtoceras* is common, both smooth and ornamented; *C. annulatum* and *C. lamellosum*, the same with those of Trenton; *Orthoceras arcuo-liratum*, *bilineatum*, and *laqueatum*, Hall, are Trenton limestone species; and lastly, there are two species of *Ormoceras*, Stokes, the larger of which is in all probability *O. tenuifilum*, Hall, a species both of the Black River and Trenton beds.

Schizocrinus nodosus, Hall, of the Trenton limestone, is the common crinoid: its stems are very characteristic.

Among the corals, one or two species of *Streptolasma*, apparently the same as those of New York, and the branched varieties of *Favosites lycoperdon*, accompanying those before mentioned; and we may here notice the *Receptaculites*, already described by Hall, but not I think identical with *R. Neptuni* of Europe. The fine series brought home by Mr. Logan shows all the structural characters;—the circular expanded form and cup-like centre,—the surface composed of rhomboidal plates, which cohere by lateral processes, and which are the flattened ends of separate and equidistant columns Unfortunately the entire structure is replaced by cycloidal silex, but perhaps it will by careful polishing enable us to see if it be really a coral, somewhat of the character of the *Tubiporidæ*.

To crown all these are slabs full of the large *Asaphus (Isotelus) gigas*, the characteristic trilobite of the Trenton rocks.

Upper Silurian Rocks.—Ascending the Ottawa to the head of Lake Temiscamang and so crossing the granitic axis of Canada, the first fossiliferous rock that presents itself is of a totally different character to that last described, as stated by Mr. Logan in his Report of Progress for 1845.

This limestone is weathered like the last; its siliceous fossils also stand out in bold relief; and one of the most common is the characteristic crinoid of the Trenton limestone, *Schizocrinus nodosus*, at least I believe I am correct in this reference. But along with this are abundance of *Favosites gothlandica*, *Stromatopora striatella*, *Cyathophyllum*, a *Heliolites* (*Porites*), with small tubes; *Syringopora* (*Harmodites*) with *Halysites catenulatus* (*Catenipora escharoides*), and *Strombodes striatus*, Milne Edwards, fossils characteristic of the *Niagara* and *Onondaga* limestones, and in America never found in the lower rocks; with these occur *Atrypa reticularis* in plenty, a *Terebratula* with three raised plaits, and very rarely a *Leptæna* or *Strophomena*. One or two spiral shells recall the shapes of some of Hall's species of *Holopea*, but are too imperfect for identification; and there is a long spiral shell, like *Murchisonia gracilis*. *Encrinurus punctatus* is the only trilobite.

The most striking shell perhaps is a species of *Ormoceras*, the short broad siphuncles of which are well preserved, while the shell has decayed, and these so much resemble those figured by Dr. Bigsby and Mr. Stokes in the Geological Transactions, 2nd series, vol. i. pl. 30, figs. 4, 5, 6, 7, that we think there can be no doubt of their identity. And it is very interesting, as bearing on the question of age, that these were found at Drummond Island, the only limestones of which are Upper Silurian.

Indeed the whole aspect of this collection, small as it is, is as strikingly Upper Silurian as that of the former one was Lower Silurian. The preponderance of the *Catenipora*, *Favosites* and *Stromatopora*, &c., is characteristic of the higher rocks, and they are associated with *Pentamerus oblongus* (the characteristic fossil of the Clinton group, which may be regarded as the base of the upper division), and this shell in America is far more limited in its vertical range than it is in Britain.

On the Increased Strength of Cast-iron, Produced by the Use of Improved Coke.

BY W. FAIRBAIRN, ESQ., M. INST. C.E.

At the Institution of Civil Engineers, a highly interesting paper on this subject was lately read by Mr. Fairbairn; it commenced with a communication from Mr. Grace-Calvert, on the subject of an improved system of depriving the fuel, whether used in blast furnaces or in remelting cupolas, of the deleterious substances by which the quality of the iron was deteriorated; or of the adaptation of the system to blast furnaces, when using coal for smelting iron ores.

The object was chiefly to point out, what were believed to be, the causes of the inferiority of iron in many works, apart from the varying qualities of the ores.

These were stated to be the introduction and application of the hot blast, which had enabled the ironmaster to reduce into cast and malleable iron, a very large per centage of cinders, slags, and other impurities, containing large proportions of silicate of iron, sulphur, and phosphorus, all of which tended to destroy the tenacity of the metal, and to render it either "red short" or "cold short"—and also, when sufficient attention was not devoted by those who were intrusted with the regulation and charging of the blast furnaces to the chemical composition of the ironstone by which the relative proportions of the flux and fuel employed in its reduction should be regulated; the chemical composition of the limestone, or the coal not being sufficiently known, these materials often varying in quality as much as the ironstone itself;—and the iron smelter was enabled to tell, with certainty, the quality of iron which this furnace would produce; instances had occurred, where a siliceous ore had been used for three or four hours successively, and then at once it had been replaced by an aluminous and sometimes by a calcareous ironstone, without the change being made in the proportions of limestone, or coal, which was evidently required by the different qualities of those ores.

The following analysis exhibited the different quantities of silicium existing in cast iron:—

White crude.	Monkland.	Coltness.	Eglington.	Dalmellington.
0·18	1·53	2·69	3·12	4·42

The injurious action which an impure fuel had upon the quality of the iron was particularly alluded to; and the necessity of removing the sulphur from the coal, or coke, when employed in the blast furnaces, before it could be imparted to the cast iron during the process of smelting, was strongly enforced. The difference in the quality of iron smelted with coal, and by the application of a process which had been recently introduced by Mr. Grace-Calvert, of Manchester, compared with iron smelted in the ordinary way, was exhibited in the following analysis:

PROPORTIONS OF SULPHUR.

Eglington pig-iron	Molted in the cupola with ordinary coke.	Melted with inproved coke.
0·336	0·281	0·191

The following table showed the improved quality of iron, after the application of the chloride of sodium in the blast furnace; by which the proportion of sulphur had been diminished:—

Monkland without chloride.	Monkland with chloride.	Dalmellington without chloride.	Dalmellington with chloride.
0·390	0·150	0·956	0·218

And the increased bearing weight of 1 in. bars, cast from these irons:—

579	627	487	556
576	655	456	525
		487	544
		470	562
			569

These improvements were described to have been effected, at a very small cost, by the following simple process. If the blast furnace was worked entirely with coal, chloride of sodium was added with each charge, in proportion to the quality of the ore and flux employed; but a better result was produced if the coal was previously converted into coke, and an excess of the chloride was used in its preparation, in order to act on the sulphur of the coal and of the ore, should any be found therein; and a greater improvement was manifested in the quality of the iron when only coke so prepared was used in the blast furnace.

The coke, so purified, emitted no sulphurous fumes when taken out of the coke oven, nor, when extinguished with water, did it give off the unpleasant odour of sulphuretted hydrogen, nor was there any sulphurous acid gas liberated during the operation of smelting iron in the cupola, or in raising steam in the locomotive boiler, by coke so prepared; and it was stated that these decided advantages were gained, in some cases, at an additional cost of only 1d. per ton of fuel.

The chemical action of the chloride of sodium was thus described.—When coal was first subjected to heat, in a coke oven, the bisulphuret of iron, contained in the coal, was decomposed into sulphur, which latter was distilled, or burned, and also into proto-sulphuret of iron, which remained in the mass, and was acted upon by the chloride of sodium, as it was volatilised at a red heat; thus chloride of iron and proto-sulphuret of sodium were produced. Then a second chemical re-action ensued: the proto-chloride of iron was decomposed into a sub-per-chloride of iron, and the chlorine gas, thus liberated, re-acted on the sulphuret of sodium, giving rise to chloride of sodium, and to chloride of sulphur, which latter was disengaged—so that the prepared coke contained less sulphur than the ordinary coke; but admitting even that a small portion remained, it would be in the state of sulphuret of sodium, which would not yield any of its sulphur during combustion, but passed into the cinders of the blast furnace, or of the cupola, and into the ashes of the fire-box, in the locomotive. Thus preventing the injurious effect of the sulphur on the fire bars and the copper of the fire-box, and on the brass tubes of the boiler of the locomotive, and the sulphur, thus fixed, did not enter into combination with the iron, preventing crystallisation during the process of smelting, and giving greater tenacity and closeness of texture both to the cast and to the malleable iron.

The second part of the paper gave the result of a series of experiments, which had been made by Mr. Fairbairn, upon trial bars 1 inch square, cast from iron melted in the cupola, with coke prepared by the process of Mr. Crace-Calvert, and exhibited specimens of the iron so prepared, when the closeness of texture and the absence of the honey-comb appearance, prevailing in the iron cast with the ordinary coke, was clearly demonstrated. The mode of experimenting was described, and the results were given very elaborately, and it was shown that the average increase of strength was from 10 to 20 per cent.

Taking the mean of the whole experiments, the following conclusions were arrived at:—

The mean breaking weight of the bars per square inch, melted with the improved coke, was ..	415·5 lbs.	
Ditto ditto with ordinary coke....	327·0 lbs.	88·5 lbs

in favour of the castings produced from the improved coke, or in the ratio of 5:4.

The experiments on the bars smelted with the improved coke, indicated iron of a high order as to strength, and might be considered equal to the strongest cold blast iron; the metal appeared to have run exceedingly close, and exhibited a compact granulated structure, with a light grey colour.

The Valley of the Nottawasaga.

BY SANDFORD FLEMING, ASSISTANT ENGINEER, NORTHERN RAILROAD.

(Read before the Canadian Institute Feb., 19th, 1853.)

I propose laying before you a brief sketch of the leading features of that tract of country which is within the water-shed of the River Nottawasaga; and the discovery at various points of ancient lake beaches, indicated by parallel terraces and sand-ridges, showing that Lake Huron at a former period stood at

higher levels, with a speculation as to the geological date of these beaches.

By looking at the map of Western Canada, it will be seen that the Nottawasaga flows into the south-eastern extremity of that division of Lake Huron known as the Georgian Bay. Although no comparison can be instituted between the Nottawasaga and the chief rivers of this Province, the St. Lawrence, the Niagara, the Ottawa and others, yet, of all the minor streams flowing into the great lakes, the Nottawasaga approaches more nearly the leading characteristics of a river, and passes through a country probably more diversified in character than any of them; it takes its rise in high broken ground, its numerous tributaries are scattered over a wide extent, and it flows through a boldly-marked valley, the bottom of which has a width of from 10 to 12 miles for a long distance before reaching Lake Huron. The other smaller streams, particularly those emptying into Lake Ontario, are generally found to flow through narrow ravines, cut by themselves during a long course of time, out of the beds of drift deposited on the surface.

The country drained by this river comprises an area of nearly 1200 square miles, about one-twelfth of which is under cultivation, the remainder being forest land; the settlements are generally distributed over the high-ground within the water-shed, and have a soil in most cases of the finest quality; the valley proper on the contrary, is as yet one continued dreary wild, a large portion of which, in all likelihood, will forever remain so, by reason of the extensive tracts of barren, sandy plains, and the fearful inundations which characterize other portions.

The roads in this quarter being not only few, but as they run for a limited distance in one particular direction, they cannot be followed with much advantage in pointing out the general features of the country. Such being the case, in order to facilitate description it will be convenient to depart from them, and guided by the pocket compass take two imaginary journies through the woods, one from East to West across the Valley, and another following the course of the river, from its source downwards, briefly noting the points of most interest, as we pass along—commencing with the former.

In the Township of Medonte and Oro the surface is much broken up into hill and dale; on the summit line some peaks may reach a height of from 700 to 800 feet above Lake Huron; the soil is clay, gravel or sand, in some places strewed with large boulders, and resembles in many respects the high ground (known as the ridges) which extends parallel to Lake Ontario from Rice Lake and Lake Scugog westward across Yonge Street. Along the South and West corner of Medonte a tract of flat, wet ground known as Craig's Swamp, situated between high abrupt banks, is found to be the summit of three streams, two of which flow into Gloucester Bay, the other, the Willow Creek, being a branch of the Nottawasaga. This swamp is 240 feet above Lake Huron, from which, following the latter stream, we by rapid descents arrive at a point near the centre of the Township of Vespra, not more than 20 feet above the Lake, although by the windings of the river it may be 25 miles inland. This is the eastern edge of what is called the Vespra Swamp or "flooded land"; (the position of which is shown in the accompanying map,) a high ridge separates this point from Lake Simcoe at the Town of Barrie, and so badly watered is this ridge, that the settlers have sunk wells to unusual depths with little success. The Willow Creek is about 100 feet under the level of Lake Simcoe, and only 5 or 6 miles distant therefrom. Proceeding westward along the course of this stream, the banks of which are level with the water, and covered with willows and other bushes indigenous to a rich moist soil, we arrive, after traversing its innumerable windings, at the Nottawasaga River, about the centre of the flooded land. The river is wide, black and deep; its summer level will average from 4 to 6 feet under the adjoining banks, and in Spring, after heavy freshets, from 6 to 8 feet above them, as indicated by the horizontal rings on many of the trees about this level; it is estimated that in some seasons nearly 25 thousand acres are covered with water; this, howeber, being caused by the rapid thawing of deep snow in the upper country, does not remain more than three or four days at this extraordinary height, and consequently effects no permanent injury to the description of timber with which the surface is covered. The soil is chiefly composed of decayed vegetable matter, and where not too low, supports trees of the largest dimensions. The whole area abounds with beaver, whose labours can be traced almost everwhere along the river banks, and since these yearly floods, will in all probability increase in volume as the country to the south becomes cleared, (judging from effects produced inolder settlements); and as the draining of this vast plain, (26 miles in circumference,) may prove a hopeless task, a secure retreat is thus provided by nature for the shelter of those live emblems of Canadian industry.

Leaving the western edge of the flooded land, we ascend by gentle slopes through Sunnidale to the Township of Nottawasaga, near the south-east corner of which, on the road from Cremor Mills to Mad River, a freak of nature rarely to be met with may be noted: i. e., the close proximity of two streams running in the same direction at different levels, shown by the following sectional sketch. The smallest stream is about the size of the

Singular position of two Streams.

Don where it crosses Hog's Hollow, (say 20 feet wide); it flows about 20 or 25 feet above the level of the larger, and is separated by a ridge of tenacious clay only about 12 yards in width. These streams are said to diverge after running parallel about a mile, ultimately joining at a greater distance. The remarkable singularity of their position, although at the present time in the midst of a dense forest, will, doubtless, point out the locality of a mill, or village, to some enterprising or speculative settler.

Continuing westward, across ravines and up steep ascents, we at last arrive at a large settlement on the eastern slope of the Blue Mountains, passing through which, and still ascending, we have to climb a rocky cliff, near the eastern boundary of Osprey. The rock is supposed to be a member of the Medina Sandstone, and is used in the locality for grinding-stones. Arriving at the summit, which must be 1,000 feet above Lake Huron, and looking backwarks over the country traversed, one of the most extensive, if not one of the grandest prospects to be met with in Western Canada, is presented to the traveller; the view is not restricted by too many trees in the foreground, and extending across Lake Huron as far as the Christian Islands to the north, and over the whole Valley of the Nottawasaga to the east and south, a semi-circle, whose radius may be upwards of 30 miles, is taken in, the dark foliage of the low ground far beneath contrasts boldly with the bright waters of the Georgian Bay, and the hills enclosing Lake

Simcoe, with a few isolated light spots, indicating clearances, appear blue in the distance.

As the high ground of Osprey tends to the northward, it terminates in a rocky escarpment, sweeping round through the Township of Collingwood, parallel to the shore; its base has a steep descent towards the coast, heavily wooded with pine, cedar, birch, and hardwood. Here the Trenton Limestone crops out rich in fossils, of which a variety and a specimen of Bituminous Shale, probably of the Utica Slate, are laid on the table.

Commencing at the southern extremity of the Valley, on the dividing ridge which separates the drainage into Lake Huron from that into Lake Ontario, and following the course of any of the principal branches of the Nottawasaga, we pass through a high, broken country, cut up by deep ravines. Reaching the Township of Essa, the high ground begins to recede, leaving between a perfectly level plain, about 3 miles in width, through which the River flows between banks from 50 to 70 feet high. In approaching the north end of the Township, these banks gradually fall away, and we enter a vast tract of barren land, extending westward and occupying nearly the whole of the northern half of Tosorontio and Essa; the best portions are capable only of supporting a thin growth of scrubby pines, and many thousand acres have been overrun by fires, which seem to have destroyed such meagre vegetation as may once have struggled into existence. The main highway from Barrie to Owen Sound passes through about 8 miles of this dreary waste, and all who have travelled it can testify that scarcely any road can be more lonely, and few landscapes could be more monotonous than the "burnt land." Leaving this wilderness, and following the course of the River, we enter at once into another equally uninhabitable, but of quite a different character, viz., the "flooded land." Here, necessarily in a canoe, and at least sheltered from the scorching rays of the sun (to say nothing of musquitoes) by a luxuriant vegetation, we glide smoothly along, and are amused by the picturesque forms into which the gigantic oaks are twisted and broken up by the herds of bears frequenting these groves, in certain seasons, to feed on acorns; and so stately are those noble trees, that they may, even in this country, be styled England's glory.

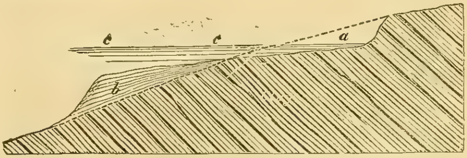
The River flows for about 12 miles through the flooded land, and enters a narrow gorge between banks about 60 or 70 feet high. The narrowness of this outlet must account, in some measure, for the annual inundations, it being insufficient in capacity for the passage of those immense volumes of water produced by the thawing of deep snows over an area of 700 or 800 square miles; and since the banks retain this height for a long distance, the possibility of draining is almost precluded.

By refering to the Map, it will be seen that at one place the River approaches within a short distance of the Lake, is deflected in an easterly direction, and ultimately finds an outlet, after running parallel to the coast about 4 miles; the whole of this spit is composed of pure sand, with a little vegitable matter mixed up with the surface at the western end. The outlet of the River is found to advance gradually eastward, and the entire area is thrown up in a series of concentric ridges, perfectly parallel, and well defined, except where broken and blown up into dunes by the wind; these ridges are, in some places, so distinctly marked, that they resemble the furrows of a ploughed field on a gigantic scale. Seeing that the ridges have every appearance of having been washed up by the Lake, that the point is yearly moving eastward, and that the coast is now no more exposed to the prevailing wind than formerly, there is every reason to believe that the whole of the deposit is due to the agency of the wind and waves. The vegetation itself tends to confirm this opinion, since, at the bend of the River (that portion supposed to be deposited first), the surface is covered with tall red pines, while, as we go eastward, these gradually diminish, both in size and numbers, until they entirely disappear. It is not here meant to be inferred that the deposit has been formed since any of these trees commenced to grow; but, that pure washed sand being at first unable to support any vegetation, through course of ages receives small accessions of organic matter, and gradually becomes more and more capable of supporting trees of stronger and stronger growth.

On the south side of that part of the River described as running parallel to the Lake, an upper and older sand ridge is found, from 80 to 100 feet above the Lake, and 40 or 60 feet above the country farther inland, its surface is cut up into sand hills which although now covered with trees have evidently been formed by the wind at a very remote period, they have all a long gentle slope towards the north-west (the prevailing wind) while the other ridge is quite precipitous—even at present the roots of the trees growing on the lee side are covered with blown sand, and those trunks which have lain on the surface for a considerable time are partially covered.

An opinion has been held by some Geologists that Dunes can only be formed on the margin of waters subject to the action of the tides, but these and other examples on the American Lakes, whose waters remain constantly about the same level, show that their formation must be referred to other causes than the rise and fall of the sea; and the discovery of these go far to confirm the opinion of those who hold that the wind is the sole agent of their formation.

There are appearances in various parts of this region which lead us to infer that the waters of Lake Huron like those of Ontario, formerly stood at higher levels than it at present occupies, parrallel terraces and ridges of sand and gravel can be traced at different places winding round the heads of bays and points of highland with perfect horizontality and resembling in every respect the present lake beaches; one of them particularly strikes the attention in the Bay of Penetanguishene, at a height of about 70 ft. above the level of the lake, it can be seen distinctly, on either side from the water, or by a spectator standing on one bank, while the sun shines obliquely on the other, so as to throw the deeper parts of the terrace in shadow. The accompanying section sketched from a cutting a little below Jeffrey's tavern in the Village of Penetanguishene, will serve to show the manner in which the soil has been removed from the side hill and deposited in a position formerly under water, by the continued mechanical action of the waves.



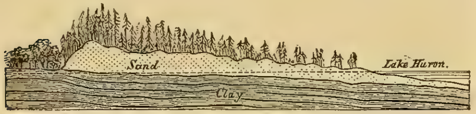
Section of Terrace around the high ground enclosing Penetanguishene Bay.

The dotted line represents former surface; *a*, washed out by waves and deposited at *b*; *c c*, supposed former level of lake.

Not only does the peculiar stratification of the lower part of the terrace confirm the supposition that it was deposited on the shore of an ancient lake, but the fact that such excavations have been made in this land locked position, where the waves could never have had much force, goes far to prove that the Lake stood for a long period at this high level.

Another ancient beach mark, about 15 miles inland, and as far as yet ascertained, about the same level as the one at Penetanguishine, can be traced for a long distance in the Township of Tosorontio—it passes through the tract of burnt land already described, the soil of which being pure sand, in all probability formed the shoals of a lake extending to the north and east, the outline of which is approximated by the dotted line marked from 70 to 80 feet high on the accompanying map. Nor are these the only traces of old lake beaches met with in this region, although the dense forest nearly everywhere covering the surface is a great impediment to their easy discovery. In the Township of St. Vincent, near the Village of Meaford, besides a very conspicuous one, corresponding in level with those already mentioned, several others of lesser note are found at various heights ; at Owen Sound, also, they are remarkably well defined ; while Cape Croker, on the western side of Georgian Bay, viewed even from a distance, and the well remembered shape of the Giant's Tomb, on the eastern, show striking evidences of having been acted on for ages by the storms of Lake Huron, when at a higher level.

It has been said that some of these terraces are estimated at 70 or 80 feet above the level of the Lake, by drawing a contour line coinciding with this height around the lower part of the valley



Section across sand-ridge extending parallel to the shore at the mouth of the Nottawasaga River.

it is found that the high ridge of sand, now in some parts blown up into dunes near the mouth of the river, will form a narrow neck of land (supposing the lake at its former level) stretching across from shore to shore, and resembling in many respects the "Burlington Beach" on Lake Ontario, and also "Fond-du-Lac" on Lake Superior; like the first it encloses a Bay of considerable depth of water but of far greater area. That this ridge has been formed in a manner precisely similar to those two by the sand washed from the adjoining shores there is great probability, in fact there is good reason to believe that the same natural agents, at present in active operation moving the outlet of the river eastward, have also formed this upper ridge by transporting the materials, of which it is composed, from the base of the escarpment at Collingwood.

In attempting to arrive at the Geological age of these ancient Beaches, it will be necessary to show whether their position, at a considerable height above the level of the Lake, may be attributable to a gradual elevation of the land or to a subsidence of the water. The last hypothesis seems the most tenable since the first would involve a local upheaval only and an inclination of the plane of the terraces at variance with their apparent horizontality. Should further researches prove the existence of terraces or other indications of old beaches on the western margin of Lake Huron, corresponding in height with those discovered along the eastern shore; the supposition that the level of the water has been lowered by the wearing away of some barrier will be strongly supported; and if this be allowed as a reasonable explanation for these geological monuments, we have then by drawing contour lines coinciding with their level, the means of discovering the probable position of this barrier. From all that I can learn regarding the relative levels of the country these lines would pass over the peninsula between Lakes Huron and Erie, at some distance inland from the river St. Clair, and would continued eastward along the shores of Lake Erie, fall within the summit of the neck of land, through which the chasm of the Niagara River is cut.

Thus, then, the traces of old lake beaches discovered in the valley of the Nottawasaga and adjacent country are coeval with the Niagara, and as it wore a deep channel through the dividing ridge between Ontario and Erie the waters of the Upper Lakes would subside to their present levels: but this conclusion can only be confirmed by more careful and more extended researches.

That the vast beds of sand at and around the mouth of the Nottawasaga have been transported by the waves from the neighboring shores, may be questioned by those who have seen the extent of the deposit, is not unlikely, more especially since the present annual increase appears so exceedingly small when brought into comparison with the whole mass—but if it be established that a length of time equal to the age of the Niagara Falls, as estimated by Lyell, be allowed for the deposition, there will be no good reason why this should be doubted; and by the acceptance of these suppositions it will not be necessary either to disregard the analogy of existing nature, or to assume that her forces were more energetic in years gone by.

In concluding these rambling observations it may not be out of place to state that as my acquaintance with the country, bordering on the Nottawasaga, has been limited, and the duties devolving upon me while in that quarter left little time for a more careful examination of the various matters referred to, I am only enabled to draw attention to them. I trust, however, it has been shown that in this region a wide and interesting field is open for the investigation of the Geologist, and although now isolated by the very worst of roads, the Railway in progress will, in a few months, bring within a two or three hours journey of Toronto what now requires as many days of fatiguing travel to reach.

On the Electrotyping Operations of the U. S. Coast Survey.

By George Mathiot, *Electrotypist: being a Report to Major* I. I. Stevens, *Assistant in charge of the Coast Survey Office.**

In compliance with your request, I present the following report of the electrotype art as now practised in this office. Most of the apparatus and processes here used are entirely new.

To clearly exhibit the advantages derived from their introduction, it will be necessary to consider the scientific principles involved in their use, and also to take a cursory view of the history of the electrotyping art.

The art of working metals by electric currents is of very recent introduction; and although it has advanced with great rapidity, it is yet, perhaps, in a state of infancy in its applications, and of crudeness in the modes of conducting it.

The electro-deposition of metals was observed by most experimenters with the voltaic battery. As early as 1804, electro-gilding had been successfully practised; but the idea of making castings by electric currents does not seem to have occurred to any one previous to the introduction of Daniel's battery, to which electro-casting is incidental.

After the introduction of Daniel's battery, it simultaneously occurred to several persons that electric currents might be used to make castings of a finer kind than were obtained by melting and pouring. Propositions to this effect are about all that can

* Dated Electrotype Laboratory, Coast Survey Office, Washington, Nov. 29, 1851, and published as appendix 55 to Senate Document, No. 2.

be attributed to the rival claimants for the invention of electro-metallurgy; for neither the English nor Russian philosopher revealed what had not been known before.

Yet to Jacobi and Spencer is due the merit of having called public attention to the subject; for in doing this, they have conferred benefits on the world greater, perhaps, than by making an original discovery.

After the publications of Jacobi and of Spencer had called the attention of the scientific world to the new art, the principles involved in it became the study of several eminent philosophers, who disclosed the methods to be followed for obtaining reguline metal. After this, several departments of electro-metallurgy rapidly advanced. Electro-plating, and the multiplication of pages of letter-press work, as pages of type, and wood-cuts, (electro-stereotyping,) were soon extensively practised; but the copying of the delicate touches of the copper-plate engraver (the electrotype proper) was beset with difficulties. On account of the great value of the engraved plate, together with the risk of its being destroyed in the attempt to copy it, and the uncertainty as to whether the duplicate would have good metallic properties, even if the operator should have the good fortune to obtain one, this department of the art (the first and most beautiful of Spencer's suggestions) was allowed to rest as an experiment or be confined to articles of small size and value.

Adhesion of Deposit to Matrix.—Electro-metallurgy requires that the deposited metal should have all its cohesive properties. If such a deposit of copper is made on a clean plate of copper, it is obvious that the deposited metal will cohere with the plate on which it is made, and an elaborately engraved plate would thus be converted into a mere mass of metal. The electrotype art, therefore, cannot exist before means are provided for preventing this destructive adhesion.

Various plans for overcoming this difficulty have been proposed All these, however, have a common feature, which is to prevent the deposit and matrix from touching by means of an intervening film of heterogeneous matter.

Mr. Smee proposes to use that coating of air which adheres so firmly to polished metals (so strikingly exhibited when the attempt is made to wet a polished knife-blade). To obtain the air coating, he directs that, after every attachment has been made to the plate, it be placed in a cool and moist celler for a few days before introducing it into the electrotype vat.

Smoke, black lead, oils, and powders, and wax, have also been proposed for covering the face of the plate.

The method used in the British ordnance survey is perhaps the best of all these. This is conducted as follows: The plate is first well oiled, and the oil well wiped away with soft bread. The plate is then heated to above the temperature of melting wax, and a cake of white wax pressed against the edge. The oil having removed the air from the plate, the wax will flash over it in an extremely thin sheet or film. All excess of wax is then to be wiped away with a fine linen cloth, free from lint. The plate must be left to cool before introducing it into the vat.

To smear the face of the finely engraved plate is in opposition to the fundamental idea of the electrotype, which is that of atomic casting. In the process of Mr. Smee, air bubbles will be retained in the fine lines of the graving, thus mutilating the copy; moreover, the face of the new plate is waved from the agitation of the stratum of air when receiving the first portion of copper.

In the waxing process it is almost impossible to free every line from excess of wax. Even days of tedious application do not insure perfection. In addition to the coarseness of these various methods, they are extremely uncertain as to whether they effect the purpose for which they are applied.

It was always observed that if the deposited metal was *not deficient* in mechanical properties, it stuck very hard to the original, and the plates had to be subjected to violent jarring, heating and beating, to separate them. But if the deposited metal was of very fine quality, then most likely the deposit was *inseparably* united to it. From these circumstances attending the adhesion of the deposit, it occurred to me that, when the cohesive force was but feebly developed in the deposited metal, then the force of cohesion or homogeneous attraction could not extend the distance presented by the thickness of the film of heterogeneous matter between the plates; but that when these forces were well developed, the spheres of homogeneous attraction of each plate would extend through the wax or air film.

It may be proper here to remark that the above views of adhesion have been applied to another department of electro-metallurgy with the most gratifying success. In electro-plating the difficulty of obtaining a firm adhesion of the film of precious metal is entirely obviated by making such arrangements as insure a rapid deposition of highly ductile metal at the moment the article to be plated is immersed in the electrolyte.

In considering the sticking of the plates, after homogeneous attraction or cohesion, heterogeneous attraction or adhesion demands attention; for two similar bodies may be separated by a film of heterogeneous matter, which binds them more firmly together than their particles are held together by cohesion, as we see in the use of cements.

This force is very powerful between some bodies, while between others it is very slight. Air adheres very strongly to metals, as before referred to; hence a film of air may unite two copper plates, even though they are separated beyond the distance at which cohesive attraction takes place.

Wax is a common ingredient in cements; its adhesive properties have become proverbial; its use is evidently improper. Therefore a substance having a strong adhesive attraction for the plates must not be on the face, and the cohesive force of the surface particles must be suspended by other methods than making the deposited metal deficient in mechanical properties.

It was hoped that a substance could be found that would act uniformly and gently on the surface of the engraved plate, and which in destroying the homogeneous attraction of the surface particles, would, by chemical union with them, form an insoluble and friable compound, having but a slight adhesion to the plate. I was led to select iodine for the experiment on account of its sparing solubilty in water, its high equivalent number, and innoxious qualities. A copper plate was well cleaned, exposed to the vapor of iodine, and electrotyped; the deposit separated from it readily. This was repeated some hundred times with invariable success.

It was found in cleaning large plates for the application of the iodine vapor, that while one part of the plate was being cleaned, another part would tarnish, and hence a uniform action of the iodine could not be obtained. This led to silvering the plates before iodizing, which facilitated the cleaning and exhibited the action of the halogen. A silvered plate was washed with an alcoholic solution of iodine and electrotyped; the electrotype separated from the matrix yet more readily than before, the iodid of silver serving better to prevent adhesion than the iodid of copper.

But it was soon observed that a plate prepared on a dull day did not separate so readily as one prepared under a bright sky, and on experimenting it was found that a plate iodized and ex-

posed to sunshine would separate with very great facility; while a plate iodized on a rainy day, and placed in a dark room for a few hours before introducing it into the vat, might stick so hard as to require some of the old resorts of heating and jarring to separate it from the matrix.

The process of iodizing and exposing to light has now been applied to a very great extent of finely engraved surface, and in no case has the least difficulty been found in lifting one plate off the other when the requisite thickness had been obtained.

I am aware that it may be thought that the iodine acts only by intervening between the plates; but the quantity of iodine applied to a plate must be thought insufficient to effect it by mere mechanical separation when we consider the large quantity of silex and carbon found in ordinary copper. If but one ounce of copper be dissolved from a square foot of ordinary plate, a very heavy deposit of impurities is left, (sometimes 5 per cent.) and the quantity of wax which may be applied to a plate, and fail to prevent sticking, is ten thousand times more than the quantity of iodine which prevents it.

In preparing our largest plates, having ten square feet of face, I use a solution of one grain of iodine in twenty thousand grains of strong alcohol. If one grain of the solution is required to wet a square foot, it will give but one-twenty-thousandth part of a grain of iodine on a square foot. But as the iodine evaporates rapidly with the alcohol, probably the actual quantity on a square foot does not exceed one-hundred-thousandth part of a grain.

Taking the weight of a cubic inch of iodine at 1,250 grains, and supposing that it remains on the silver surface in its elementary state, instead of forming iodid of silver, then we have $1,250 \times 144 \times 100,000 = 18,000,000,000$, only one-eighteen-thousand-millionth part of an inch for the thickness of the coating of iodine. Even if we suppose that the solar rays decompose the iodid of silver, and leave the iodine in vapor on the plate, it will still be only one-forty-four millionth part of an inch—a thickness to be taken as nothing in a mechanical view.

To test the effect of the chemical method of preventing adhesion on the sharpness of the engraved lines, an engraving was seven times successively transferred from plate to plate, when the closest inspection failed to show any inferiority of impressions from the last plate as compared with those from the first.

Time and expense of electro-casting.—Next in importance to securing a certain and easy separation of the matrix and casting is bringing the entire time and expense of electrotyping within the narrowest limits.

Mr. Smee and others have shown that the quality of electro-metal is determined by certain relations between the rapidity of forming the plate and the strength of the solution in which it is formed. Both the common operations of the electro-metallurgist, and the improvements he proposes, must conform to these relations.

As small quantities of electricity are easily set in motion, small-sized electro-castings are readily made in six or eight days. To make large castings in a short time requires a powerful current. To accomplish the corresponding augmentation in the effective electric action has proved a somewhat difficult matter.

At the date of the "Aide Mémoire to the Military Sciences," it is stated that in the ordnance survey one pound of copper was deposited in twenty-four hours on a plate of eight square feet, the plates being made ductile enough to bear hammering only by continued agitation of the electrolytic solutions.

At this rate, to make a plate one-eighth of an inch thick will require forty-five days. So far as I am informed, the above performance has not been excelled, as to quality and time, on large work anywhere prior to its being attained as now to be described.

The first and most obvious suggestion for increasing the rate of deposition is to enlarge the battery; this, however, is incapable of producing the desired end.

To present this subject in a clear and satisfactory manner, I will make use of the celebrated formula of Professor Ohm, who deduced from mathematical reasoning, and established by experiment, that the effective force of the current from any battery was directly as the electr motive force, and inversely as the resistance offered to that force.

To express this, he gave the equation $\frac{E}{R+r}=Q$, in which E represents the electromotive force, or affinity of acid for zinc, and $R+r$ the resistance to the current generated by that force; R representing the resistance offered to it from the liquid contained between the positive and negative elements of the battery, and r the resistance offered by the object on which the battery is working, and Q the amount of work executed, or the quantity of the current obtained.

The resistance of conductors has been found to be directly as the length, and inversely as the section.

So far as concerns form of arrangement, E is constant for the materials used, as it depends on their chemical relations, Q can therefore be favorably affected only by varying R or r. Now, as R represents the resistance of the liquid contained between the battery plates, to increase the size of the plates is only to increase the section of the liquid, or, in other words, to diminish the resistance represented by R. The expression, $\frac{E}{R+r}=Q$, shows that, if the resistance in the battery is small compared to the external resistance, the gain of effect from enlarging the battery plates is but small.

To determine the relative value of R, as compared with r, a battery was constructed so as to collect and measure the gas evolved by its action,

The plates were placed in contact with each other, and the gas evolved in thirty minutes taken as a unit of effect. As in this case the current did not pass through anything but the battery, there is no resistance to be represented by r, or r in the formula will be equal to 0 and $Q=\frac{E}{R}=1$.

The battery was then attached to a pair of electrodes, in a certain solution of sulphate of copper and sulphuric acid, especially recommended by all the writers on electro metallurgy, the arrangement being such as to produce good metal. The gas now evolved in thirty minutes was found only one-twentieth of the former amount; hence the introduction of the resistance, r, had diminished Q twenty times, and $\frac{E}{R+r}=Q=\frac{E}{20\ R}$, whence r is equal to 19 R. To exhibit the effect of battery enlargement, we now have $Q=\frac{1}{\frac{1}{m}\times 19}$. If $m=1$, then $Q=\cdot 05$; if $m=2$, $Q=\cdot 0512$; if $m=3$, $Q=\cdot 0518$; if $m=4$, $Q=\cdot 0524$, &c., &c. This shows a gain of only a fortieth from doubling the size of the batterry, &c.,—an advantage too small to repay for the enlargement. These calculations are in accordance with experimental results from small batteries, but in large ones the necessity of further separating the plates, in increasing their size, makes the resistence increase, instead of diminish, but there is conse-

quently a loss from enlargement. It is not, therefore, by merely increasing the battery surface that the time for electrotyping can be shortened.

Mr. Smee, the distinguished writer on electro-metallurgy, by covering the negative plate of the battery with pulverulent platinum, produced a very energetic form of the instrument. When the plate is freshly platinized, it acts violently, and throws off the hydrogen in torrents. But this increased energy of the plate is gradually lost, from the electric current depositing upon it impurities from the zinc.

As this deposit has a strong attraction for the hydrogen, it is retained on the plate. The plate, being thus encased in air, is virtually excluded from the liquid of the battery. The ordinary solvents of the metals do not readily remove this coating of impurity. The plate can be renewed by replatinization; but, as this is both tedious and expensive, I was urged to find a menstruum which would restore the original platinum to its energy. This I attained, at length, by immersing the plate in a solution of per-chlorid of iron, which almost immediately restores the action of the plate.

The plates are now daily immersed in the chlorid of iron, by which the tone of the battery is constantly maintained.

By this last discovery, together with obtaining better solutions for the decomposing cell, the time for making a casting was reduced; but still the time required for making a plate was too long when only one electrical equivalent was employed.

The effective force of one battery may be added to another. This is increasing E in the formula, and this will sometimes increase Q.

We unite the effective force of many batteries by joining their dissimilar ends in consecutive order. As the current in such an arrangement has to traverse every battery in the chain, R will be multiplied as many times as we multiply E. The formula then becomes $Q=\frac{n\,E}{n\,R+r}$. When the value of r and R are nearly equal, and we have batteries of definite construction to work with, it becomes a matter of some importance to determine whether we shall use the whole galvanic apparatus, as a single electrical equivalent, by connecting all the similar parts of all the battery cells, or whether we shall convert it into a battery of two pairs, in consecutive order, by joining dissimilar ends. As dividing the battery is doubling R, and to double the electrical eqivalents is also to double R, we shall increase R fourfold by the double arrangement. Instead of $Q=\frac{E}{R+r}$ we have $Q=\frac{2\,E}{4\,R+r}$. Taking $R=r$ we have $Q=\cdot50$ in the single arrangement, and $Q=\cdot40$ in the double—showing that we may double the expense, and yet make the casting more slowly than before. Conditions as above are of frequent occurrence, and a knowledge of them without experimenting is of very great importance.

For $R=10\,r$, with a single equivalent of battery, $Q=\frac{1}{1+10}=0\cdot0909$. For two batteries in series $Q=\frac{2}{2+10}=0\cdot166$. The use of two batteries in consecutive order, as thus exhibited, doubles the expense, but does not double the effect. A regard for economy prohibits us from further increasing the series. To represent an effect double of $\frac{E}{R+r}$ we have $2\left(\frac{E}{R+r}\right)=\frac{2\,E}{\frac{2\,R+r}{2}}$

As dividing R by 2 is doubling the battery surface, we may now make $Q=\cdot183$. The gain per cent., now indicated by doubling the surface, makes it advantageous to make this increase when two consecutive batteries are used.

The difficulty of obtaining large flat plates of silver proved a serious obstacle in effecting an increase of battery surface, for the irregularity of the surface requires the plate to be placed at an increased distance from the zinc, thereby augmenting R, the very thing sought to be diminished.

Plates could be made flat by the planishing hammer; but the operation being expensive, and the plates continually liable to accidents in use, economy prohibited this mode of forming flat plates. Though the plating of metallic bodies with silver had been well executed, it had not yet been determined that electro-casting of silver could be executed in a desirable manner, and at a moderate expense and trouble. At first, every attempt to make plates weighing 2,500 grains to the square foot failed, on account of the impossibility of observing Mr. Smee's laws of electro-metallization for the time required.

But after modifying the solutions of silver, and using a register battery, a plate could be made in thirty hours, perfectly flat, and possessing the mechanical qualities of hardness, elasticity, and malleability, in an eminent degree, and not costing over 16 cents per ounce for the making.

The perfectly flat plates admit of a very close approximation to the zincs. Their size may therefore be increased to more than twice their former surface, as in the double arrangement, r is relatively smaller to R

Important changes have also been made in the modes of operating, and in the arrangement of the apparatus. It had early been noticed that changes of temperature influenced the rate of working; and every electro-metallurgist knows the importance of keeping the laboratory warm.

To determine where and how the effect of temperature took place, a battery, at 60 degrees Fahrenheit, was connected with a wire 120 feet long, and enclosing a galvanometer. The deflection was 40°; the battery was then cooled until the temperature was 48°; the needle was still deflected nearly 40 degrees.

This experiment indicated that the batteries were not greatly affected by ordinary variations of temperature. Advantage was then taken of this development to secure a more perfect ventilation. Accordingly, a small room, to contain the battery, was partitioned off from the general department by a glass partition, and large outward openings made at the top and at the bottom of the room, to give a circulation of air for carrying off the bat-fumes.

At the stage of improvement now described, one of our medium plates, having eight square feet of surface, could be readily made in from eight to ten days. But wishing still further to quicken the process, or attain my first desire—to deposit one pound per day on the square foot, with a single equivalent of battery—improvements were again sought after. As the E of the formula has been increased to the greatest extent the cost would permit, and R had been diminished, or the plates increased in size to the greatest useful extent, it was sought to increase Q by diminishing r, or the electrolytic resistance. It was sought to increase the conducting power of the electrolyte by adding easily decomposable salts to it; but with no success. The accelerating effect of temperature being found, as above stated, to be confined chiefly to the decomposition cell, it was evident that by using the electrolyte alone, at a high temperature, a considerable advantage might ensue.

To determine the most advantageous working temperature, and the resulting gain of effect, a voltameter battery was connect-

ed to a pair of electrodes, in the solution formerly described as being generally recommended. Each electrode had five square inches of face, and was coated on the back to prevent radiation. They were placed one inch apart, and had thin plates of wood bound against their edges, to prevent any lateral spread of the current in passing between them. The following was then obtained:

Battery plates in contact gave 300 cubic inches gas per hour.							
Electrodes in contact	do.	216	do	do.	do.		
Current through electrolyte, at	58°,	gave	16	cubic	in. gas	per h.	23·15
do.	do.	60°	do.	20	do.	do.	18·15
do.	do.	100°	do.	27	do.	do.	13·00
do.	do.	175°	do.	37	do.	do.	8·96

The last column of figures shows the value of the resistance of the solution, as compared with B of the formula. This column was obtained by first uniting the battery plates, and afterwards the electrodes.

From the above table it appears that heat may be made to diminish the resistance in the decomposition cell in the proportion of 2·58 to 1; and the whole resistance by 2·25. And as $\frac{2\ E}{R+r}=\frac{E}{\frac{R+r}{2}}$; therefore, by heating the electrolyte, we may with a single electrical equivalent make a plate as rapidly as by working at atmospheric temperatures with two batteries in consecutive order, with double surfaces, (four times the battery and twice the expense.)

But as Smee's laws require that, in forming a plate, certain mutual conditions of apparatus be maintained, it follows that alterations in one element or condition must be attended by corresponding changes in the others. Hence, if the temperature of the electrolyte be raised to a certain point, and the apparatus correspondingly adjusted, it is evident that, to avoid incessant adjustment, the original temperature must be maintained.

Thus, to avail ourselves of the advantages experimentally found from heating the solutions, an apparatus for steadily maintaining a high temperature in the electrolyte through several successive days becomes indepensable.

As the electrotype operations are not suspended at night, it is important that the heating apparatus should perform its office for at least twelve hours without supervision or replenishing its fuel; and its action should be sensibly uniform, during all the time, between successive replenishings.

Such an apparatus I have devised, and is now in use. A peck of charcoal furnishes fuel for twelve hours, and maintains 100 gallons of copper solutions steadily, at any required point between 100° and 200°.

With the above arrangement in use, I have made a large reverse or alto, and returned the original to the engraving department in 55 hours from its being placed in my hands. This time included trimming the edges and the preparations to prevent adhesion.

Again recurring to Ohm's formula, the relative value of R to r was once more experimentally found. This gave $R:r::1:4$ or $Q=\frac{1}{1+4}=0·20$, a great improvement as compared with the first determination of $R:r::1:19$, or $Q=\frac{1}{1+19}=0·05$. Having now made r so small compared with R, the size of the battery can be profitably increased until the result is about 0·24. Moreover, using a double arrangement of cells with the double surfaces, for a double effect, we now have $2\left(\frac{1}{1+4}\right)=\frac{2}{2+4}=0·40$. As the relative resistance of the electrolyte becomes now still smaller, we may yet more increase the battery surface, until the result is nearly 0·5.

The electrotype has now ceased to be a mere experiment, uncertain, expensive, and slow. I have lately formed plates of most excellent quality, at the rate of three pounds to the square foot, in 24 hours. This rate will require but two days to form one of our largest plates, having ten square feet surface, and one-eighth of an inch thick.

Actions in the electrolytic solution.—The quality of the deposited metal is governed solely by the relations between the *quantity* of the electricity passing through any solution and the amount of metal the solution contains. The usual supposition is, that the acid of the salt goes to one electrode and the metal to the other, but it is now ascertained that no such mutual transfer takes place; for, while the acid is carried to the positive electrode, the metal is *not* carried to the negative electrode. Hence, however strong the solution on commencing the process, the negative electrode, by abstracting the metal in its vicinity, is soon surrounded with a weak solution. With a simple wire electrode, the exhausted solution surrounding the electrode is readily renewed by mere difference of specific gravity producing a flow. But, with large parallel plate electrodes, this rapid renewal of dense solution becomes impossible, and the electrode is soon surrounded with a weak solution. This state of things must be recognized in adjusting our battery arrangements. Electrotypists not aware of this fact find themselves much perplexed by failing to accomplish with large plates what is so easily done with medals or small plates.

It would, at first sight, appear that, by strengthening the solution of sulphate of copper, a more rapid supply of metal to the electrode would be obtained. Unfortunately, the effect of this is to diminish the solvent capacity of the water in the solution for the sulphate formed on the positive electrode by the action of the transferred acid. The grand essential in electrolysis is liquidity. Thus, if the quantity of free water surrounding the positive electrode be small, this electrode is soon enveloped in a saturated solution, and the newly-formed salt remains undissolved upon it. This salt, being a non-conductor, virtually excludes the electrode from the solution, and thus arrests the current, except when the efflux of saturated solution permits the salt to dissolve, and so reopens the passage for the currentin irregular quantities. From this spasmodic action result plates of copper-sand, or sometimes copper as soft as lead.

By applying heat to the solution when this state of things exists, the solvent capacity of the water for the salt is increased, rapid diffusion takes place, the salt is carried to the negative electrode, and the exhausted water to the positive electrode; the dormant batteries rush into uninterrupted action, and in a short time a plate is deposited, having all the hardness and elasticity of hammered or rolled copper. Smee's conditions, then, seem to maintain themselves. The electrotypist's axiom of "work slowly," requires to be reversed into "the quicker the work, the better the quality."

Notice of the "Mastodon Giganteus" of Dr. J. C. Warren.*

We have already breifly announced the publication of the magnificent volume on the "Mastodon Giganteus," by the eminent surgeon and scholar, Dr. Warren. Turning aside from the profession which he has honored by his profound knowledge and successful labors, he here enters the arena of Science, and substantiates his claims to a distinguished place among the Zoologists of the age.

*Description of a Skeleton of the Mastodon Giganteus of North America, by John C. Warren, M.D., &c. 219 pp 4to, with a frontispiece and 27 plates in 4to. Boston: 1852. J. Wilson & Son, 22 School Street.—*Sill Jour.*

Dr. Warren has the rare pleasure of possessing the noblest specimen of the Mastodon Giganteus that has yet been discovered; and fortunate it is for the old mastodon, that it has found a final resting place with one who has had the generosity and ability to raise so munificent a mausoleum to its memory. A second skeleton was afterwards purchased by Dr. Warren. to aid him in his researches; and, for the same purpose, he has also added to his collection the skeleton of an elephant. This elephant—the one accidentally drowned a few years since in the Delaware—stands in his fine hall, by the side of the huge mastodon, and although a large animal of the kind, it is a pigmy in comparison. Dr. Warren was thus well equipped for the prosecution of his researches; and no labor or expense has been spared, either in carrying forward his investigations, or in the publication of his results.

The title page of the volume presents a view of the region near Newburgh on the Hudson, where the skeleton was exhumed. Among wooded hill lies a large morass, part of which in the front of the scene, has been excavated by the removal of the surface peat of the bog, and the subjacent marl, leaving the skeleton as it was found lying sprawling out, with the ribs and nearly every bone in its place. The fore-feet extended beyond the head, and the hinder are thrown forware near the body.

It was in the summer of 1845 that this burial place of the ancient giant was first disturbed. The swampy land was then dry. Mr. Brewster, while digging in the place to obtain the earth for fertilizing his fields in the vicinity, after penetrating through two feet of peat bog, one foot red moss, and a foot of the shell marl, struck upon the head of the animal. The exhumation went on rapidly the next day, and the cranium, "bones of the spine, tail, pelvis and ribs were successively found, for the most part in their natural relation to each other;" and at the end of the second day, nearly the whole skeleton had been exposed. The bones were in an admirable state of preservation. It seems from the position, Dr. Warren observes, as if the animal had stretched out its fore feet in a forward direction, to extricate itself from a morass into which it had sunk.

Even the undigested food of the animal appears to have been partly preserved. Dr. Prime testifies that* "in the midst of the ribs, imbedded in the marl, and unmixed with shells or carbonate of lime, was a mass of matter composed principally of twigs of trees, broken into pieces of about two inches in length, and varying in size from very small twigs to half an inch in diameter. There was mixed with these a large quantity of finer vegetable substance, like finely divided leaves; the whole amounting to from four to six bushels. From the appearance of this and its situation, it was supposed to be the contents of the stomach; and this opinion was confirmed on removing the pelvis, underneath which in the direction of the last of the intestines, was a train of the same material, about three feet in length, and four inches in diameter." The subsequent examination of a portion of this material by Dr. Warren, Prof. Gray, and Dr. Carpenter, supports the opinion here expressed; and both from this case and other examples of exhumed mastodons, it is shown that the mastodon lived on stems or twigs of trees; part of the material found was probably "some kind of spruce or fir."

Such are some of the facts which are here published by Dr. Warren concerning the discovery and food of the mastodon.

In his account of the animal, after his historical sketch, and some observations on the name of the species, he enters upon the description of the various parts of the skeleton, in detail; and excellent lithographic plates illustrate these chapters. One of these plates, of very large size, represents, in admirable style, the entire skeleton. The following are some of the dimensions given:

	FEET.	INCH.
Height of Skeleton,	11	
Length from anterior extremity of face to the commencement of the tail,	17	
Circumference of the trunk around the ribs,	16	5
Length of tail,	6	8
" " trunk,	10	3
" " head from the occipital condyles in a straight line to anterior edge of tusk-socket,	3	2
Entire length of tusk,	10	11
Depth of socket of tusk,	2	3
External length of tusk,	8	8

There are 7 cervical vertebræ, 20 dorsal, 3 lumbar, and 5 sacral. The ribs are twenty in number, 13 true, and 7 false. From the 6th to the 11th their length is between 52 and $54\frac{3}{4}$ inches. The first has more the appearance of a clavical than a rib, and is 28 inches long. Bearing on the number of ribs, Dr. Warren observes, (p. 31,)

"The last two false ribs on the right side are co-ossified for the space of 8 inches;—the result of a fracture near their vertebral attachments: the union of these ribs, at its broadest part, measures 8 inches. These bones are perfectly smooth within, and without are quite strong, at the place of union and massive. This fracture is of great importance, as by the union is verified the remark of Cuvier, who found only 19 ribs, but stated that there would, in his opinion, be hereafter found twenty—a fact entirely established in this specimen, first by the articular surface on the side of the 20th dorsal vertebræ; and second, by the co-ossification of the 19th and 20th ribs."

After describing the several bones throughout the structure, the author treats at considerable length of the characters of the teeth. Those of the elephant are first described by way of comparison, their number (twenty-four exclusive of the tusks,) composition, and form being considered. On taking up the ondontography of the mastodon, the author commences with some general observations, and then proceeds to a minute account of each of the teeth in succession. Omitting the mass of details, we cite the following from his General Remarks, pages 61 and 64:

"While the teeth of the elephant are, as already said, composed of three kinds of hard matter, dentine, enamel, and cement, those of the Mastodon giganteus are constituted principally of two of these substances, dentine and enamel. Prof. Owen has shown that a layer of cement invests the fangs, and is spread over the crown, but the basis of the crown and of the fangs is formed by the dentine; while in the teeth of the elephant, and some others of the Pachydermata, the cement, by it perpendicular interspersed layers, constitutes a substantial part of the body of the tooth, as well as a protecting covering to its surface. A great portion of the Mastodon tooth is formed by dentine. The mamillary eminences, or mastoid projections also have a basis of the same substance, but they are invested with a covering of enamel, which in molar teeth in my possession, measures from the sixth to the fourth of an inch in thickness. In teeth which have been worn, the enamel is ground down in various degrees; thus altering the surface of the crown to an appearance approximating, in the Mastodon giganteus, to the lozenge-shaped ridges of the African Elephant.

* * * * * *

The number of the teeth was long involved in mystery. The genius of Cuvier opened the way to a knowledge of their number, differences and developement. He advanced no farther in

* p. 144.

the path he had opened than to the fourth, or, at the utmost, fifth tooth; making the whole number to be from sixteen to twenty, exclusive of the great incisors or tusks.

In 1831, Dr. Hays, the distinguished editor of the 'American Journal of the Medical Sciences,' read a paper before the American Philosophical Society, in which he described various jaws of the Mastodon giganteus, and the teeth contained in them. He seems to have been the first writer who clearly pointed out the probability that the number of these teeth was six on each side of each jaw in the Mastodon giganteus, and of course the whole number twenty-four. He says 'the whole number of teeth possessed by the animal described by Dr. Godman, (Tetracaulodon) is then at least twenty; and we think that it is at least probable, that the animal possessed an intermediate tooth between the second tooth with three denticles, and that with four denticles. Should we be correct in our views, this animal possessed three teeth with three denticles in each side of each jaw, making the whole number of teeth twenty-four; but to render this certain would require specimens of intermediate ages, to those hitherto described.' These have since been obtained, and have fully confirmed the opinion suggested by the sagacity of Dr. Hays. In the collection of the Cambridge University, there is a series of jaws affording a perfect demonstration of this fact, and settling the number to be twenty-four. Professor Horner, in a paper read to the Philosophical Society, thought that there might be a greater number. De Blainville makes them twenty-four.

The specimens in the collection of the American Philosophical Society, those of Cambridge University, various others in New-York, Albany, and in my private collection, support the opinion hat the number is twenty-four, and no more.

The teeth are not all developed at the same time, but in succession, in proportion to the waste of those which have preceded. At first appear two small deciduous teeth, or milk molars; next follows a third tooth, also deciduous, larger and more complicated than the former; then a fourth tooth, of the same form as the last, though greater in size. These four teeth sometimes co-exist, as in the Tetracaulodon's jaw, from the museum in New York, originally described by Dr. Godman, and afterwards more particularly described and represented by Dr. Hays in the 'Transactions of the American Philosophical Society,' vol. iv. To the teeth already mentioned succeeds a fifth tooth, of the same form as the last, but rather longer. Before the appearance of this, and even in most cases before the fourth tooth shows itself, one or more of the first teeth have disappeared. The sixth and last tooth is much larger, and formed in a mould different from any of the others."

The plates represent in a beautiful style the dentition of several skeletons, exhibiting the jaws and teeth of different ages.

The *tusks*, which are *incisor teeth*, enormously developed, are treated in the following chapter, as follows, pp. 87—90:

"Besides the regular intermaxillary tusks, there are two very small ones, which show themselves in the upper jaw at the earliest period of life, but shortly disappear and are succeeded by the permanent tusks. This is shown by cutting into the tusk-socket of our calf elephant head. The fact well established in regard to the elephant, seems to afford presumption, that besides the great intermaxillary tusks of the Mastodon, there may be others in the upper or lower jaw, which appearing at an earlier period of life, are, in the greater number of instances, lost before the animal has advanced far in its existence.

In the present specimen of the Mastodon, there are two tusks in the upper and one in the lower jaw on the left side. Two undoubtedly existed in the lower jaw, at an early period of life, as the relic of the right cavity is perfectly distinct, retaining a depth of an inch and a half, and nearly its original diameter.

The Superior Tusks.—The tusks of the upper jaw were ten feet and eleven inches long; but being broken soon after exhumation, only the anterior termination of each (in length about four feet and in diameter at the truncated extremity five inches) remains in a perfect condition. The middle portion, rather more than two feet has crumbled. The posterior portion, of about the same length with the anterior, is broken into laminæ; it is flattened at the base, so as to be half an inch longer in one diameter than in the other, making the largest seven inches and a half. The bases are surrounded externally by circular elevations, at first two inches distant from each other, but gradually increasing in distance, until, at about two feet from the extremities of the bases, they disappear entirely.

The tusk is composed of laminæ which at the internal extremity of the socket, are not more than a line in thickness.—These laminæ increase in number as we advance from the butts, so that where the tusk issues from its socket at the distance of rather more than two feet from the posterior extremity, the internal cavity has diminished from seven inches in diameter to two by two and a half. The plates into which the tusk has separated in drying are generally an eighth of an inch in thickness, some of them nearly an inch. The external surface has a brown appearance; the layers which have been recently uncovered are of a lighter color.

The following analysis of a portion of the tusk has been kindly furnished me by Dr. Chas. T. Jackson:

Animal mattter (cartilage),	26·2
Phosphate and carb. of lime, fluorid of calcium, &c.,	69·2
Water	4·6
	100·0

Glass was etched with the fluorine. The constituents of the tusk are phosphate of lime, carbonate of lime, fluorid of calcium phosphate of magnesia, soda, sulphur.'

The laminæ at the anterior part of one of the tusks, which is, best preserved, are superficially not more than half a line in thickness; they are divided or split by longitudinal fissures about three-fourths of an inch apart; and they present none of the circular marks seen at the posterior extremity. The point anteriorly is worn away for the space of two inches on one side, as is generally found to occur in the tusks of the proboscidian family.

When the tusks were first discovered, they lay with their convexities outwards, their points approaching each other; having apparently turned in their sockets after the soft parts which retained them were decomposed so as to loosen their attachments. For the weight of the head inclined the butts downwards, while the resistance of the marl on their inferior and internal sides would give a rotary motion outward and upwards to a definite extent. In this direction they were placed by Dr. Prime, who had an opportunity of observing them in their original position in the embedding marl. Although the extremities of the butts are somewhat oval, the greater size of their sockets owing to the decomposition of the soft textures which lined them, would readily admit the butts of the tusks to be placed in any direction; and considering the apparent inutility and the remarkable anomaly of the position before mentioned, we thought it right to change their opposing aspect to one more consonant with the character and attitude of the skeleton.

The Inferior or Mandibular Tusk.—The small mandibular tusk has been brought into notice of late years by Dr. Godman, who considered it as characterizing a new species, to which he

gave the name of Tetracaulodon, as will be shown hereafter. Professor Owen has attached a new importance to this tusk, as one distinctive character between the genus Mastodon, and the genus Elephas; a distinction which M. de Blainville, Dr. Falconer and others, have been willing to pass over. But hitherto, so far as we know, the existence of this part in the elephant has not been discovered; while it is perfectly established in regard to the principal species of Mastodon, the Mastodon giganteus, and Mastodon angustidens. So long as this fact remains uncontroveried, we should consider it, taken in connection with other facts, as forming an impassable boundary between the two families.

This tusk is eleven inches long, five and a half in circumference, and two in diameter at the base; being longer by an inch than the cast of a similar one in the collection of the American Philosophical Society, which was taken from the specimen originally described by Dr. Godman, and disinterred by Mr. Archibald Crawford near Newburgh. The direction of our tusk is forward and downward, forming an angle with a horizontal line of about 45°. It has a cavity an inch and a half in diameter at the internal extremity, the thickness of the edge being one-fourth of an inch; this cavity is of a conical form, and two inches deep. The rest of the tusk appears to be solid. The anterior extremity is rounded and about an inch in diameter; on one side it has been worn away to the extent of four inches. The worn surface is smooth at its extremity only, the rest being quite rough; the depth of the external layer is exposed in this abrasion, and exhibits the thickness of an eighth of an inch. Near the posterior or internal extremity are seen a number of circles, to the amount of ten or eleven, extending from the base, to two or three inches forward, and occupying that part which lay in the socket. The surface of the tusk generally exhibits longitudinal striæ, in some of which, cracks begin to appear from desiccation. These striæ are distant from each other from a fourth to an eighth of an inch. The color of the tusk is brown, excepting three inches of its anterior extremity, which are nearly black. At the fissures it is seen to be composed of laminæ about the sixth of an inch in thickness. It is perfectly firm and free from any marked evidence of decomposition."

Dr. Warren mentions more or less fully and figures other Mastodon skeletons found in the United States. Plates 16, 18, 19, are devoted to the Shawangunk head found at Scotchtown, Orange Co., New York, which is particularly described. The size of this head is not exceeded by that of any other hitherto discovered. Its greatest breadth is 31 inches, its vertical elevation $33\frac{1}{4}$ inches, and the length from the ridge of the occipital plane to the extremity of the intermaxilary bones, is 48 inches.

The characteristics of some other species of Mastodon occupy several pages of the work; and the so-called *Tetracaulodon* is recognized as the male of Mastodon giganteus.

The work closes with a dissertation on the food and supposed discovery of hair of the M. giganteus, and on its geological situation and causes of preservation. The author states that of the five skeletons known at this time, three have been found in the fresh water marshes of Orange Co., N. Y., a fourth in an interior morass in New Jersey, and the fifth near the banks of the Missouri, probably in a fresh water deposit. Scattered bones are common from various parts of the country, and even from the far north. They are reported from the surface soil, peat marshes, beds of marl or loam, etc.; but, as Lyell observes, there is yet no satisfactory evidence of their occurrence beneath the proper drift.

The North American Mastodon bones hitherto found appear to belong to the same species, excepting a single tooth, reported from Caroline County, Maryland. Dr. Warren enters into the history of this tooth, discusses the possibility of its being a stray tooth from another continent, and concludes that it is what it purports to be, a true Maryland fossil, closely related to the Mastodon Humboldtius (or M. *angustidens* if the two are one), of South America, if not identical with it.

An Appendix contains various facts of interest, and among them a description of a specimen of the Mastodon angustidens found near Turin, (called the Dusina Mastodon), taken from Sismonda's "Osteografia di un Mastodonte angustidente," published at Turin, in 1851.

CORRESPONDENCE.

The letter of a "Member of the Canadian Institute," which we publish below, together with a plan of the City Frontage on the Bay, are worthy the attention of those interested in the long talked of Esplanade project. We have not been favoured with a knowledge of the plan contemplated by the City authorities, and cannot therefore say how far the one proposed by our Correspondent may agree with it; but are of opinion that although our Correspondent's ideas may to many appear somewhat chimerical, and especially so to interested parties, yet the plan he proposes may certainly form a basis for a general arrangement highly advantageous not only to the City at large, but also to the Railway Companies. We would especially direct attention to the proposed manner of passing from the streets to the wharves *over* the Railroad tracks, thereby completely avoiding the accidents so common at level crossings on crowded thoroughfares, and infinitely increasing the facilities for business. This part of our Correspondent's plan would effect a similar object to that which it is costing the Great Western Roada, very heavy outlay to accomplish through the City of Hamilton.

We are greatly indebted to Mr. Scobie for permission to transfer a portion of his excellent map of the City as an illustration of our Correspondent's letter.

Railway Termini and Pleasure Grounds.

To the Editor of the Canadian Journal.

Sir,—Believing that one object of your Journal is to facilitate the dissemination of information relating to the public improvements of the Province, and that the Society, of which it is the official organ, is established, if not chiefly, at least to a certain extent, for that purpose, I have little hesitation in addressing you on a subject already exciting some attention in Toronto, viz.: "The Railway Termini and improvement of the water frontage of the City"; and if you should consider that the scheme propounded contains any suggestions which may be of value to those who have the carrying out of these improvements, or the subject matter of importance sufficient to enlist the attention of your readers generally, it may probably be not unworthy of a place in your columns.

The water frontage of Toronto, extending over a length of from 2 to 3 miles, and up to the present time almost unoccupied, is now about to be used for Railway purposes. Adjoining thereto, and extending about $\frac{3}{4}$ of a mile along the south side of Front Street, immediately to the east of the Old Fort, a tract of land averaging in width about 100 feet, was some years ago reserved for the public as a promenade or pleasure ground, which Reserve is also being appropriated by the Railway Companies for their own use.

Much has lately been written, and far more has been said, regarding the occupation of the water frontage by the Railway Companies, and

the appropriation by them of the above mentioned Reserve—one party advocates the conversion of every foot of ground now lying waste into "track," "brick and mortar"—another party, with more concern for the healthful recreation of future generations than the convenience of the present, insists on these Reserves for pleasure grounds being retained for the purpose they were originally intended to serve. But the question is not whether the portion of ground referred to should or should not be used in the manner proposed; for the Railway Companies are empowered by their charters "to enter into and use these lands or such parts of them as may be necessary for the making and maintaining of their works," and the fact that the use intended to be made of these lands, may probably be *most* conducive to the public weal, is a mere accidental or extraneous circumstance; the lands would not be so used unless it was believed by these Companies to be conducive to their own interests.

All must admit, however, that the interests of the public and of the Railway Companies are *one* in the most important particulars, and that every facility should be afforded them in endeavouring to establish their works at the most suitable points; but if in so doing it be found expedient that these public grounds should be peaceably surrendered for the purposes of business—the life and soul of all commercial cities—it ought not to be forgotten that posterity has some claim on the representatives of the public at the present day, and surely some effort should be made, before it is too late, to provide breathing space for those who come after us. The great demand for building space, the rapid filling up of that which is vacant, and its consequent increasing value, will, in a very few years, make it next to impossible to open up grounds such as are provided for the adornment of older cities, and considered not only beneficial, but necessary for the recreation, amusement and instruction of the masses. It will, indeed, be a reproach, if within the limits of the City of Toronto, comprising an area of six square miles, and which half a century ago was just emerging from the wilderness, a few acres be not set apart and held inviolable for these purposes.

Again, without one general plan subscribed to by all parties concerned, it is not quite clear how the location of the various Railway Termini can be otherwise than fraught with litigation, inconvenience, and even difficulties of an engineering character;—the first has already commenced, but the last is in store for the future, and will, doubtless, along with the first increase in a ratio proportionate to the number of Railways from time to time constructed. In proof of which, we have only to observe what is now taking place, and what may probably follow. The Directors of the first Railway constructed take possession of the most eligible part of the water frontage, make wharfs, erect buildings, and lay down tracks leading thereto; the 2nd Railway secures space sufficient for its Terminus, but in reaching it, has to pass through the grounds of the 1st.; the 3rd Railway, with some trouble and much expense, procures length and breadth for its wharfs and buildings, but in approaching thereto has to cross the tracks and cut up the arrangements of the 1st and 2nd.; and so also with the 4th and 5th Railways constructed to the water frontage, either forced to pass along the public streets to the only available positions left, or crossing and re-crossing the tracks previously laid, and interfering with the terminal arrangements of other Railways.

The disadvantages of such a course of proceeding may be summed up in a few words:—Making and unmaking works of a costly character (reckless expenditure); crossing and re-crossing of the tracks of the various Railways, (increased chances of collision); innumerable level crossings, (danger to foot passengers and horse-vehicles); Termini improperly connected with each other, (inconvenience to travellers); and destruction of pleasure ground reserve without giving an equivalent in kind, (probably expedient, but not desirable);—all of which may be obviated by adopting in good time a plan of arrangements on a scale commensurate with the prospective business of the City; and although many years may elapse before its entire completion, yet each part could be made in accordance therewith, and in such a way as to form a portion of a grand whole.

The accompanying plan, briefly described underneath, will show how easily extensive arrangements could *now* be made without interfering with existing structures, while delay of even a few months would, to say the least, make the carrying out of any general plan a matter of some difficulty. It is unnecessary to trouble you at present with the financial portion of the scheme, or the manner in which the private holders of water lots could be fairly dealt with, since this is a matter for careful consideration and legislative enactment. That the plan proposed, embracing a space of from 250 to 300 acres, devoted chiefly to Railway terminal purposes, and shipping, will be considered by some persons far to extensive or even utopian, is not unlikely; but knowing the lavish expenditure and embarrasment which too restricted arrangements have caused in other places, and seeing the almost magical advancement which the city is now making, I venture to say, that without some comprehensive scheme, more money will eventually be sunk, directly and indirectly, than might be required to carry out step by step to completion, any plan however extensive or however costly.

It is proposed to set apart a strip of land throughout the entire length of the City, of a width sufficient to accommodate nine Railway tracks, to be level with the wharfs, to be crossed only by bridges, and to be used solely as a Railway approach and for Railway connections

Front Street straightened as shown on the plan, to be converted into a Terrace above the level of, and separated from the "Railway approach" by a retaining wall and parapet, to be 120 feet wide, and planted with rows of trees throughout its whole length.

The entire area south of the Front Street Terrace to be on the wharfage level, and reached by slopes from the bridges. The bridges may be of iron, of a simply ornamental character.

The space to be set apart for each of the Termini to be determined by the Government, the Corporation, and the agents of the Companies; the manner shown on the plan being, of course, merely arbitrary.

Each Railway to have its own particular tracks on the Approach, with sidings to the various Termini for the purpose of forming connections.

The number and size of the "slips," and the detail generally of each Terminus being governed by the requirements of the Companies, to be designed and carried out by them in accordance therewith, it being only requisite that the piers do not extend beyond certain defined limits.

It is also proposed to reserve certain portions (to be under the surveillance of the City Corporation) for the landing of steamboats unconnected with the Railroads, for private forwarders, for Baths and Washhouses or for general public service; the places allotted for this purpose on the plan, are situated at the foot of York and Yonge Streets and at the rear of the St. Lawrence Hall, and are named respectively the "Niagara," the "City," and the "St. Lawrence Basins."

No localities are better adapted for extensive arrangements of this character, and at no future time will it be possible to carry out any general plan at so little cost, since few erections of any consequence now exist, and none need at present be interfered with. All the Railways would have free intercourse with each other, without a single level crossing. And a grand terrace, perfectly straight for upwards of two miles, planted with trees, like the "Paseo" of Havana, would be more than an equivalent for the pleasure ground reserve taken from the public for other purposes. From this terrace the fresh breezes from the lake might be enjoyed—the arrival and departure of shipping, and the marshalling and moving of trains viewed by the young and the old without fear of danger.

While contemplating improvements on so grand a scale, the selection of a site to be dedicated to a great Public Building should not be lost sight of,—I refer to one which even now the want of is felt, viz:

"The Canadian Museum," for the formation of which the Canadian Institute is making strenuous exertions,—and also a permanent home for that Society. The very best situation would doubtless be on the vacant space at the intersection of Yonge Street, with the Grand Terrace, (where the Custom House and Soap Factory now stand) or south of the Railway tracks facing the bridge from Yonge Street, as shown on the plan. There can be no good reason why the building should not be sufficiently extensive to include a Merchants' Hall and Exchange under the same roof, or offices for Telegraph Companies, Brokers, &c., in its basement—or why it should not be as ornamental and imposing as its central position would require, or the purpose of its erection demand.

It is unnessary to advocate farther the adoption of some general plan acceptable to all concerned, and suitable to the wants and wishes of the public, for the advantages must be evident and manifold. There would doubtless be considerable difficulty in bringing to a satisfactory issue, a matter involving so many different interests,—but by the union of the City Authorities with the various Chartered Companies and the appointment of a Board of Directors from among each to carry out a plan suited to their common interests the most beneficial results would be produced and instead of each acting independently of the other, and adopting various and conflicting regulations, a bond of union would be thoroughly cemented between them and plans might be matured and carried out, on a scale so extensive and so perfect as would be one of the greatest—the very greatest characteristic of Toronto.

A Member of the Canadian Institute.

The Grand Trunk Railway Company.

Appendix to the Prospectus.

The Grand Trunk Railway of Canada, with the Atlantic and St. Lawrence Railway of Maine, 1,112 miles in length, with an uniform gauge of five feet six inches, as now brought under the notice of the British public, offers the most comprehensive system of railways in the world. Protected from the possibility of injurious competition, for nearly its entire length, by natural clauses as well as by Legislative enactment, it engrosses the traffic of a region extending 809 miles in one direct line from Portland to Lake Huron, containing a population of nearly three millions, in Canada, Vermont, New Hampshire and Maine. At Portland it connects with the system of railways reaching eastward towards the Province of New Brunswick, and hereafter to Halifax in Nova Scotia, as well as southward, by lines already existing to Boston and New York. At the frontier of Canada it again unites with other lines to Boston and the great manufacturing districts of New England. From Richmond it runs eastward to Quebec and Trois Pistoles, 253 miles, giving direct access to the great shipping port of Canada in Summer, and hereafter by rail to the Atlantic at Halifax by Trois Pistoles and Miramichi, forming the only route to the great fisheries of the Gulph of the St. Lawrence, and the eastern timber, coal, and mineral district of New Brunswick. At Montreal it again meets three railways now in operation between Boston and New York. At Prescott it receives the tributary line from Bytown and the west timber districts of the Ottawa, sixty miles, now in course of early completion; and on the opposite side of the St. Lawrence, the Northern New York road to Ogdensburgh will pour its stream of passenger traffic upon the Trunk Line. At Kingston the Rome and St. Vincent railroad, also from New York, becomes its tributary. From thence to Toronto it receives the entire produce of the rich country North of Lake Ontario, through the channel of Belleville and Peterborough branch, and several other new lines already in progress to construction, and all tributary to the Main Trunk Road. At Toronto, the Ontario, Simcoe, and Huron Railroad, 100 miles, now nearly finished, pours in the traffic of the region around Lake Simcoe and Georgian Bay. At the same point is also met the Great Western Railway by Hamilton to Detroit, 240 miles now in a forward state of completion, by which communication is had with the southern part of Western Canada, as well as with the Railways in operation from Detroit to the States of Michigan, Illinois, and Wisconsin.

From Toronto, westward, the line passing through the heart of the western Peninsula of Canada, ensures to the Grand Trunk the exclusive traffic of the finest part of the Province; while at its terminus at Sarnia it debouches at the very outlet at Lake Huron, avoiding the shallows of the Detroit and St. Clair Rivers below—a point the most favorably situated for the navigation extending through Lakes Huron and Michigan, and hereafter through Lake Superior. At Sarnia, the American railroads now in course of construction place the Grand Trunk Line in the most direct communication with the arterial line to the Great Western and the Mississippi, a region whose advance in population and wealth has been regarded as almost fabulous, and yet whose resources are still very partially developed; while the traffic of the copper and iron districts of Lake Superior, the most valuable and extensive in the world, with the coal of Michigan, will accumulate on the railroad at this point, reaching ocean navigation at Montreal in much less time and by the same milage that it can now pass by boat to the waters of Lake Ontario, 350 miles above that city.

The Grand Trunk Railway of Canada, it will therefore be seen, commencing at the debouche of the three largest lakes in the world, pours the accumulating traffic in one unbroken line throughout the entire length of Canada, into the St. Lawrence and Quebec, on which it rests on the north, while on the south it reaches the magnificent harbor of Portland and St. John's on the open ocean. The whole future traffic between the western regions and the east, including Lower Canada, parts of the States of Vermont and New Hampshire, the whole of the State of Maine, and the Provinces of New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland, must therefore pass over the Grand Trunk Railway.

This great and comprehensive scheme of railway communication throughout the most wealthy, populous and important colonial dependency of Great Britain, is not now offered as a new project to the public. It comes with the guarantee of the Province of Canada, which has embarked upward of two millions sterling in the enterprise; it is supported by the most intelligent, far-sighted men in the colony; and it has the security of nearly half a million sterling of private Canadian capital invested therein, while a conviction of the great benefits of unanimous action has provided a combination of railway interests probably never before seen, and ensuring such an energetic and harmonious working of the entire line, as cannot but produce the most satisfactory results.

The Grand Trunk Railway does not rest for its success altogether on anticipations. The entire section from Portland to Montreal, of 290 miles, is now in operation for 250 miles, and will in July next be fully connected, making the shortest and most easy communication between the River St. Lawrence and the Atlantic Ocean. This part of the line forms in itself a complete railway, opening up an entirely new channel for the Western trade, and giving an outlet in winter for the produce of Eastern Canada as well as that of Western Canada east of Kingston. The line from Quebec to Richmond brings Montreal and Quebec within six hours of each other, and opens to those cities the most direct access to the ocean at Portland, Boston and New York, passing through a most populous and fertile part of Eastern Canada. To Montreal, until the completion of the western section of the Trunk Line, the produce of the countries surrounding the great lakes is brought through the most magnificent inland navigation in the world; and the opening of the line to Portland at once secures the supply of the markets of Maine, New Brunswick, and Nova Scotia with breadstuffs, receiving in return, viz: Portland, British and American manufactured goods, West Indian produce, &c. The lines from Montreal to Portland, and from Richmond to Quebec, already known as the St. Lawrence and Atlantic and Quebec and Richmond Railways, will be in full and continuous operation in the course of the present summer, comprehending 390 miles of railway, for which the capital has been entirely provided with a very small exception. The receipts on 72 miles in Canada, from the mere local business, from the first twelve months from their opening on the 20th of October, 1851, were £34,000. On 91 miles of the line from Portland, now under lease, were, for the same period, £38,000. Assuming the same rate per mile on the entire distance of 390 miles, a gross income of £172,300 will be at once obtained from local business; while the total traffic, if estimated by the receipts per mile of the Ogdensburgh road, £25 per mile per week, the latest American railroad offering any parallel, will amount to a sum of £507-000, independent of the great future development of the country opened up by the line. It may be assumed that the revenue of the Company, from the sections to be completed in 1853, will not fall short, at once of 304,200 per annum, net, allowing 50 per cent. for working expenses, and deducting £60,000 for lease of Portland line, would leave *nearly equal to the charge for the entire mortgage debt of the Company, and thus from actual present earnings securing to the bondholders their interest on all the capital intended to be raised by debentures.*

It is proposed simultaneously with the construction of the railroad westward, to proceed with the bridge over the St. Lawrence at Montreal. A work of this stupendous character, required to span a navigable river of two miles in width, can only be undertaken by a large combined capital, and is justified by its paramount importance. The site selected is at the sole point of the river St. Lawrence, from the great

lakes to its mouth, where a bridge can be placed without interfering with the navigation. And also at that point no less than 1,595 miles of continuous railway, now in operation with a very insignificant exception, from New York, Boston, Portland and Quebec, arrive on the south shore of the river opposite to Montreal, a city containing 60,000 inhabitants. On the northern shore, the railways either in progress or completed, including the western section of the Grand Trunk, number already 967 miles exclusive of projected lines. The completion of this link is essential to the satisfactary and economical working of the Grand Trunk Railway; and it has therefore been incorporated with the entire line. It will be constructed according to the plans and under the superintendence of Robert Stevenson, C. E., (who is about to visit Canada for this purpose,) and Alexander McKenzie Ross, Esq., C. E., and the structure will be of that substantial character which a work of such magnitude requires.

For the bridge an ample allowance of capital is made and the work has been provisionally contracted for with Messrs. Peto, Brassey, Betts and Jackson, on the estimate framed by Messrs. Stevenson and Ross. The Act authorizing the construction of this bridge by the Grand Trunk Railway Company, is now in progress through the Canadian Parliament, under the sanction of the Government.

The western section of the Grand Trunk Line extends from Montreal to Toronto, 345 miles, and from thence to Sarnia, 172 miles. Contracts have been executed, with the approval of the Government and the Board of Railway Commissioners in Canada, with the eminent English contracting firm of Messrs. Peto, Brassey, Betts and Jackson, for the construction of the section to Toronto, 345 miles, from Quebec and Trois Pistoles, 155 miles; and the Grand Junction, 50 miles; and with the Canadian contracting firm of C. S. Gzowski & Co., and from thence to Sarnia, 175 miles.

The conditions of these contracts are for the construction of a first class single track railway, with the foundations of all the large structures sufficient for a double line, equal in permanence and stability to any railway in England, including stations, sidings, workshops, ample roling stock, and every requisite essential to its perfect completion, to the satisfaction of the Canadian Government.

By means of the arrangements entered into with the contractors, the proprietors of the Grand Trunk line are assured that, for the capital stated they will secure the delivery of the whole railway, fully equipped and completed in every respect, and free from any further charges whatever.

The western section of the Grand Trunk commences at Montreal, and proceeds westward through the towns and villages of Lachine, St. Clair, St. Anne, New Longueil, Lancaster, Charlottenburgh, Cornwall, Osnabruck, Williamsburgh, Port Hope, Bond Head, Bowmanville, Whitby, Pickering, Scarboro' to the City of Toronto, which city contains 36,000 inhabitants.

At Toronto it meets the Great Western Railway, leading through Hamilton and the southren parts of the western peninsula of Canada to Detroit; a connection, of which the value may be judged from the favorable position in which the Great Western Railway of Canada now stands in London. This line itself forms a continuation of the Trunk line, although under a different company, for 240 miles, now approaching completion. The Trunk road also here connects with the Northern Railroad to Lakes Simcoe and Huron, 90 miles, to be finished during 1853.

This section occupies the important position of connecting the chief emporia of Eastern and Western Canada, the cities of Montreal and Toronto, numbering together nearly 100,000 inhabitants, besides passing through the towns already enumerated; and it also passes through its entire length, through the most populous and cultivated district of the Province.

The section west of Toronto to Sarnia passess through the towns and villages of Weston, Brampton, Georgetown, Acton, Rockwood, Guelph, Berlin, Peterburg, Hamburgh to Stratford, where it is intersected by a proposed line from Goderich, 45 miles (for which £125,000 has been already raised by municipal subscription), thence through or near Downie, Fullarton, Blanchard, Usborne, Riddulph, Bosanquet, Warwick, and Plympton, to the outlet of Lake Huron, and the western extremity of the Province at Port Sarnia; the whole course of the line being through the finest section of Western Canada, a district already peopled, and most rapidly advancing in population and wealth.

It will therefore be seen that the western section of the Grand Trunk Line, in its connexions, embraces the whole of Canada West, a district of 32,000,000 of acres, with a population doubling itself every ten years, and which, with a limited exception, must find in the Grand Trunk Railway their speediest, most direct, and cheapest intercourse; having neither local railroads nor canals to compete with.

The route traversed by the Grand Trunk Railway and its tributaries will be found set forth in the accompanying map.

That portion of the Great West, situate at the western extreme of the basin of the St. Lawrence, has received a larger share than any other portion of the country of the valuable addition to its riches, arising from the industry, intelligence and wealth of the hundreds of thousands who, within a comparatively brief period, have migrated to these regions.

Independent of the local traffic peculiar to this section, both in passengers and goods, through traffic of more than ordinary extent, consequent on its geographical position, may be safely calculated upon.

Not the least important branch of traffic will arise from the ocean steamers communicating with England, making Portland, and hereafter, Halifax, the port of embarkation, as the nearest and most accessible on the continent of America.

A further and important consideration in connection with Portland, St. John's and Halifax, is that the navigation never being closed by ice, produce may on the completion of the Grand Trunk Railway, be shipped there when otherwise there would be no ready means of forwarding it to Europe.

Thus, with the exception of that portion through Nova Scotia to the port of Halifax, (about 150 miles,) the entire length of 1,400, both by the southern route through the State of Maine, and by the northern route by Trois Pistoles, is for a great part in course of construction, and the remainder will be shortly commenced under highly favorable auspices, the immediate prosecution of that portion through Nova Scotia being now under the consideration of the government of that province whose future interests are so largely compromised in the speedy and perfect completion of the project, as to ensure their best and strenuous efforts for its early accomplishment.

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*The Darien Ship Canal.**—We have now before us the "Journal of the Expedition of Inquiry," of Mr. Lionel Gisborne, C.E., the Atlantic and Pacific Junction Company's Engineer, with his report in full, just published by Saunders and Stanford, Charing-cross. The almost entire absence of any correct knowledge of that narrow neck of land which unites the two Americas, except what has been left us by the historians of the buccaneers of the sixteenth century, the difficulties of internal exploration, the hostility of the few remaining aboriginal Indians, the attractions offered to enterprise and the introduction of capital, from its reputed mineral wealth, and the short distance for uniting the two great oceans, render every information from actual description of personal research of the most interesting kind. It appears certain that, up to the period of Mr. Gisborne entering on his expedition, only one European (Dr. Cullen) had ever crossed the Isthmus of Darien; but there appears no doubt that there exists more than a single locality in this uncivilised tract where inquiry is likely to be rewarded with success; and Humboldt himself, after devoting half a century to the study of Central America, felt thoroughly satisfied that the Isthmus of Darien is superior to any portion of the entire neck for a canal. Travelling through a tropical climate, left entirely in a state of nature, it can easily be imagined is a task beset with difficulties and dangers; and throughout Mr. Gisborne's journal it is made tolerably clear that he has not been exempt from the common lot. We are happy to find, however, he has accomplished his task, returned in safety and in every point he corroborates the views of Dr. Cullen, as to the practicability of a ship canal without locks, as proposed by Mr. John Henderson; and that the Isthmus of Darien is the only point where it can be successfully carried out. In the commencement of the volume the author shows that all writers hitherto on the Isthmus are not to be relied on, appearing to vie with each other in a series of contradictions; their observations generally being totally inconsistent, breathing an obstinate and one-sided view, and their information being not founded on personal knowledge, but mere report. He then describes the several other projected routes, exposes their total impracticability, and endeavours to prove, of which we think there is little doubt, that a ship canal may be completed, at the part of the Isthmus pointed out by Dr. Cullen, 30 ft. deep at low water, 140 ft. broad at bottom, and 160 ft. at low water surface, and cut through from sea to sea a perfectly open channel, through which steamers may proceed at all times, and sailing vessels either go with the current, which will flow alternately each way, or be towed by steamers. With respect to a navigation with locks, of which Mr. Gisborne has given an estimate of £4,500,000 instead of £12,000,000, it is to be decidedly objected to, as, however well constructed, no care can guard against accident or neglect, which may obstruct the whole transit for months. Delay and risk there must be where such enormous machinery is worked; and there cannot be a doubt but shipowners would rather pay a higher toll to pass direct

* Mining Journal.

from ocean to ocean, than run the risk, and incur the delay, of lock navigation. The volume throughout contains valuable information as to the climate and character of the country; and although the author occasionally indulges in a jocular humour hardly compatible with so commercially grave a subject, it is written in a racy and amusing style; while it conveys a tolerably clear idea of the habits of the few aborigines he met with; the products and capabilities of the country; the difficulties to be met with and surmounted; and more particularly the world-wide advantages which will accrue on the completion of this grand enterprize, for the accomplishment of which the author was sent out to make the necessary surveys. The enormous benefits to the shipping interest; the increased number of distant voyages which could be made; and the facilities afforded to commerce generally by the construction of the Darien Ship Canal, will, we have no doubt, instigate the sympathies of all, and insure the most influential support; and looking back to what has already been effected by the engineers who are taking the initiative, we leave it in good hands, and have no fear of the result.

SCIENTIFIC INTELLIGENCE.

Belcher's Artesian Well, in St. Louis, (from the St. Louis *Republican.*)—Allusion was made a few days since to the progress of the Artesian well that Mr. Wm. H. Belcher is sinking in the upper part of the city to supply his extensive sugar refinery with other than limestone water, which only can be found by the ordinary channels in this vicinity. The well, which we think was commenced early in the year 1849, has now attained the great depth of 1590 feet. The boring still progresses without intermission, night and day, the hands, six in number, relieving one another by regular watches. The iron "sinker," with which the drilling is effected, is 34 feet in length, 2½ inches in diameter, and between 700 and 800 pounds in weight. It is attached to poles, severally about 30 feet long, that are screwed to each other to extend to the full depth of the well. The whole is moved by a "doctor," worked by the boilers used for the refinery engines. Several veins of impure water have been struck in the course of the excavation, to rid the well of which, a pump, also worked by the "doctor," is constantly in operation. At the present depth of 1590 feet a pretty copious stream of sulphur water issues from the well. The water has the taste precisely of the Blue Lick water in Kentucky, though perhaps not quite so strongly impregnated with sulphur. We have obtained from the gentleman who superintends the boring, an exhibit of the different strata through which it has passed. The statement possesses sufficient interest for publication:

1st, through limestone, 28 feet; 2d, shale 2; 3d, limestone 231; 4th cherty rock 15; 5th, limestone 74; 6th, shale 30; 7th, limestone 75; 8th, shale 1½; 9th, limestone 38½; 10th, sandy shale 6½; 11th, limestone 128½; 12th, red marl 15; 13th, shale 30; 14th, red marl 50; 15th, shale 30; 16th, limestone 119; 17th, shale 66; 18th, bituminous marl 15; 19th, shale 80; 20th, limstone 134; 21st cherty rock 62; 22d, limestone 138; 23d, shale 70; 24th, limestone 20; 25th, shale 56; 26th, limestone 34; white soft sandstone 15 feet.

The well was first commenced, we understand, as a cistern. From the surface of the ground, where it is fourteen feet in diameter, it has a conical form, lessening at the depth of thirty feet to a diameter of six feet. Thence the diameter is again lessened to sixteen inches, until the depth of 78 feet from the surface is attained. From that point it is diminished to nine inches, and this diameter is preserved to the depth of 457 feet. Passing this line the diameter to the present bottom of the well, is three and a half inches.

The lowest summer stand of the Mississippi river is passed in the first strata of shale, at a depth of twenty-nine or thirty feet from the surface. The water in the well, however, is always higher than the water line of the river, and is not affected by the variations of the latter. The first appearance of gas was found at a depth of 466 feet, in a stratum of shale one and a half feet thick, which was strongly imbued with carbonated hydrogen. When about 520 feet below the surface of the earth, at the beginning of a layer of limestone, the water in the well became salty. The level of the sea—reckoned to be five hundred and thirty-two feet below the City of St. Louis—was passed farther in the same layer; two hundred feet lower still, in a bed of shale, the water contained 1⅞ per cent of salt. At a depth of 950 feet a bed of bituminous marl, 15 feet in diameter, was struck. The marl nearly resembled coal, and on being subjected to great heat, without actually burning, lost much of its weight. In the stratum of shale which followed, the salt in the water increased to 2¼ per cent. The hardest rock passed, was a bed of chert, struck at a depth of 1179 feet from the surface, and going down 62 feet. In this layer, the salt in the water increased to full three per cent. The boring at present is, as appears by the statement above, in a bed of white soft sandstone, the most promising that has yet been struck for a supply water such as is wanted.

Observations have been made with a Celsius thermometer of the temperature of the well. At the mouth of the orifice, the thermometer made 50 degrees; at the depth of 45 feet, the heat is regular, neither increasing nor diminishing with the variations above, and at the distance of 1351 feet, the heat has increased to 69 degrees.

The Artesian well of Mr. Belcher is already one of the deepest in this courtry; it is considerably more than half the depth of the celebrated Artesian well in Westphalia, Germany, which is sunk 2.385 feet. If the recent indications do not deceive, a supply of sweet pure water will be soon obtained.

Royal Institution.—On one of the lecture evenings in March last the theatre of the institution was completely filled to hear Sir Charles Lyell describe some of the results of his late geological researches in North America. The immediate subject of the lecture was "On the remains of reptilians, and of a land shell, recently found in the interior of an erect fossil tree, in the coal measures of Nova Scotia;" but he took occasion to enter at considerable length into the causes of the formation of coal-beds and their intermediate strata. The coal measures of Nova Scotia, and the different strata associated with them, are three miles in thickness, the coal measures alone extending to the depth of 1,400 feet. The dip of the strata along the coast of the Bay of Fundy affords a fine opportunity for examining the whole depth of the coal measures which rise successively to the surface; and Sir Charles Lyell traced distinctly sixty-nine levels at which they have been submerged under the sea. Among the beds of the formation several are filled with the remains of a peculiar plant, to which the name "stigmaria" has been given; and it was generally considered by geologists to constitute a distinct and separate vegetable organization. Sir Charles Lyell said he had long suspected that these fossils were only the roots of trees that had been broken off and carried away by some sudden inundation. This suspicion had been confirmed by his researches in the coal measures of Nova Scotia, for he had succeeded in several instances in digging from the coal upright trunks of trees to which portions of stigmaria were attached as roots. The trees thus found were sigillaria, a plant somewhat resembling a bamboo, having a hard exterior and a soft, pithy substance inside. It was within an erect fossil tree of this kind that Sir Charles discovered the remains that formed the immediate subject of the lecture. On examining the interior of the tree, which was less completely fossilized than the exterior, he and some scientific friends who accompanied him found first the leg-bone of a reptile, and afterwards other remains which proved it to have been a water-lizard similar to a species now existing in America. Lower down they came to the land shell; though it was so mutilated that it could not be ascertained with certainty whether it was a shell or a cosprolite; Sir Charles, however, being decidedly of opinion that it was a land shell. The importance of the discovery of the remains of a reptile in the fossil tree consists in its being the first time that any trace of reptilians has been found in the coal measures of America. Sir Charles Lyell accounted for the remains being in such a position by supposing that the lizard must have climbed up the tree when it was standing on the mud bank of the estuary of some great river, and that the creature had taken shelter in the inside. The deposition of the land shell he also attributed to the position of the tree at the mouth of a large river where fresh and salt water are frequently commingled. With respect to the coal measures, Sir Charles Lyell said he considered their formation to be owing to vast extents of dense vegetation growing on the mud banks deposited in the deltas of great rivers, and which having for a long time resisted the action of the water, and prevented further deposition, were at length again submerged and covered with *debris* from the mountains. As an exemplification that the cause assigned might be adequate to produce such an effect, Sir Charles instanced the quantity of solid matter carried down by the Ganges. In the elevated country where that river takes its rise it has been ascertained that the fall of rain is equal to a depth of six hundred inches in a year; and this volume of water, concentrated in the channel of the Ganges annually, forces along with it a mass of matter which it has been calculated is equal in bulk to sixty times the solid contents of the great Pyramid, of Egypt. With that known force in existence, Sir Charles Lyell thought there would be little difficulty in conceiving that by the continued operation of such a cause, through countless ages of times past—on which geologists were now permitted to draw without limitation—the immense masses of matter in the coal formation might be accumulated in successive strata.

A Scientific Golddigger.—Among the passengers by the Falcon which arrived in the Mersey a few weeks since from Sydney, was Mr. John Calvert, a geologist, who has been 11 years in the Australian colonies. During that time he has made a geological survey of all the mineral districts in Adelaide, Van Diemen's Land, Sydney, and New Zealand, and he has brought back with him a map of the western goldfields which alone is 30 feet long. He has also a large number of drawings, some of them valuable in a scientific point of view, and others pleasing and instructive, as giving a sketch of life and manners

at the gold diggings. Mr. Calvert has himself been engaged for eight years in tracing the auriferous veins and in procuring gold. A short time ago he sent home a block of quartz weighing a ton and a half, and he has brought home with him in the Falcon 730 nuggets of the precious metal. One of the pieces weighs 23lbs. of pure gold, and we had the opportunity of seeing a peice weighing 1½lb., which is considered one of the best specimens, being, in the state in which it was discovered, above the standard. The amount of gold brought home by Mr. Calvert is about 330 lbs. gross, between 70 lb. and 80 lb. being dross or quartz more or less mixed with the gold. The largest quantity he ever obtained in one day was 76 lb. weight. He had been led to the spot by auriferous indications, increasing as he came nearer, for a distance of nearly 40 miles. The quartz vein ran north and south, and was from about 9 to 15 feet in breadth, half a mile from where he robbed it of its precious treasure. It stands out in large blocks of from 15 to 20 feet in height, looking in the distance like white houses. This place is distant from Sydney about 215 miles, and a long way from any at present worked gold-field. During the latter part of his residence in Australia Mr. Calvert had a camp and three men as assistants, and, properly equipped, he pursued his scientific survey. Among his discoveries, he found diamonds, rubies, and many valuable minerals, in which the Australian colonies abound. We understand that Mr. Calvert will proceed direct to London, where he intends to get his drawings and maps transferred to canvass, for the purpose of exhibiting them as a panorama of the goldfields, illustrative of lectures which he intends to deliver on the origin of gold, and on the colonies towards which so many thousands of his fellow-countrymen are now turning their attention.—*Liverpool Mercury.*

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—April, 1853.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario : 108 feet.

Magnet	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch.	S'nw in Inch.
"	1	29.481	29.578	29.688	29.596	34.8	46.7	34.8	38.83	0.187	0.170	0.116	0.162	93	55	56	69	N b E	N	N N W	- -	- -
"	2	.798	.795	.749	.781	31.4	43.1	31.9	36.82	.139	.203	.159	.165	79	74	89	83	N b E	E	Calm	- -	- -
"	3	.702	.492			37.3	44.2			.185	.147			84	51			Calm.	E N E	—	- -	- -
"	4	.308	.146	.100	.162	36.6	38.8	35.9	37.35	.190	.202	.200	.203	88	86	95	91	NE b N	Calm.	N N W	0.175	Inap.
e	5	.041	.102	.151	.100	34.1	44.4	33.8	37.83	.179	.136	.166	.16[illegible]	92	46	86	75	N NW	N W b W	Calm	0.055	Inap.
e	6	.103	.315	.523	.339	34.5	44.9	33.4	37.02	.186	.194	.123	.159	94	67	65	73	N E	N W b N	N W b N	- -	Inap.
"	7	.547	.540	.556	.547	30.5	43.6	32.1	36.12	.137	.220	.171	.184	80	78	95	86	Calm.	S	Calm	- -	Inap.
"	8	.500	.191	28.918	.202	32.3	51.0	48.1	45.07	.162	.286	.310	.254	89	78	94	84	Calm.	S b W	W	Inap	- -
"	9	.204	.370	29.504	.376	40.2	52.4	40.2	44.05	.188	.208	.208	.200	75	53	84	71	S W	W b S	S	- -	- -
b	10	.638	.833			33.0	39.8			.162	.186			87	77			N W	N W b W	—	- -	- -
d	11	.904	.839	.339	.761	27.0	44.9	36.3	36.07	.139	.256	.169	.185	87	87	79	84	W N W	SE b S	Calm	0.100	- -
b	12	.573	.479	.530	.526	37.3	44.1	42.2	41.18	.209	.269	.251	.242	95	94	94	94	Calm.	Calm	Calm	0.270	- -
b	13	.638	.534	.385	.513	41.5	36.0	35.1	37.75	.252	.200	.181	.212	98	95	89	94	NE b N	N E	N E b N	0.715	- -
b	14	.455	.625	.789	.633	32.7	36.6	30.9	33.37	.172	.188	.154	.168	93	87	89	88	N E b N	N b W	N W b N	0.020	Inap.
a	15	.946	.847	.930	.920	30.4	40.9	34.5	36.08	.157	.122	.171	.155	93	49	86	75	N N W	S b E	Calm	- -	- -
c	16	.891	.810	.758	.813	37.0	45.9	37.0	40.32	.182	.220	.184	.200	83	71	84	81	N E b E	E b S	N E	- -	- -
b	17	.773	.765			37.4	43.4			.177	.155			79	55			N b E	S b E	—	- -	- -
c	18	.810	.782	.712	.747	32.0	48.1	34.2	39.33	.141	.248	.161	.187	78	75	81	77	N	S S E	N E b E	- -	- -
b	19	.667	.558	.531	.579	28.0	53.6	39.1	41.70	.148	.212	.212	.212	96	52	90	82	Calm.	E S E	N b E	- -	- -
b	20	.563	.599	.667	.617	38.4	53.7	48.1	49.32	.174	.208	.281	.217	75	46	85	65	N b E	S b W	N b E	- -	- -
d	21	.706	.658	.504	.609	34.9	60.7	48.3	49.52	.171	.285	.268	.25[illegible]	85	55	87	75	Calm.	S S E	E N E	0.390	- -
d	22	.241	28.955	.383	.210	46.7	57.8	47.4	50.98	.297	.438	.270	.336	94	94	84	90	NE b E	SE b S	N W b N	0.130	- -
e	23	.659	29.722	.725	.715	31.9	44.5	36.1	37.67	.159	.187	.138	.159	89	64	70	72	N N W	N b W	N b E	- -	- -
c	24	.746	.678			36.0	41.8			.148	.151			70	58			N E b E	E b S	—	0.200	1.0
ab	25	.537	.578	.666	.599	34.3	41.1	32.3	36.50	.183	.198	.156	.184	94	77	86	86	N E b N	N	Calm	Inap	- -
b	26	.709	.674	.653	.678	33.4	54.2	41.4	44.02	.148	.149	.212	.190	78	36	82	69	Calm.	SE b E	Calm	- -	- -
b	27	.688	.622	.623	.642	38.1	61.4	51.7	51.58	.188	.302	.275	.275	82	57	73	73	Calm.	S S W	Calm	- -	- -
b	28	.669	.629	.582	.620	44.5	65.7	56.0	57.05	.236	.368	.420	.357	81	59	96	79	Calm	S E	Calm	0.570	- -
b	29	.553	.688	.812	.689	48.8	49.9	43.1	47.62	.321	.271	.201	.261	93	76	73	79	N b E	N W b N	N	- -	- -
b	30	.862	.923	.958	.910	38.4	50.9	40.6	43.47	.206	.277	.166	.214	89	76	66	76	N W b N	S W	N N W	- -	- -
	M	29.579	29.551	29.575	29.5689	35.76	48.38	39.40	41.92	[illegible]6	.231	.206	.21[illegible]	87	70	83	80	Ml's 4.05	Ml's 7.46	Ml's 3.97	2.625	1.0

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1964.88	1172.87	621.82	895.06

Mean velocity of the wind - - 5.20 miles per hour.
Maximum velocity - - - - - - 21.2 ml's per h'r, from 1 to 2 p.m. on 8th.
Most windy day - - - - - - 8th : Mean velocity, 10.71 miles per hour.
Least windy day - - - - - - 12th: Mean velocity, 0.29 ditto.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 29.974, at 8 A. M., on 15th } Monthly range:
Lowest Barometer - - 28.985, at 2 P.M., on 22nd } 0.989 inches.
Highest observed Temp. - 65.7, at 2 P. M., on 28th } Monthly range:
Lowest regist'd Temp. - 25.0, at A.M., on 11th } 40.7
Mean Highest observed Temperature - - 47.68 } Mean daily range:
Mean Thermometer Minimum - - - - - 33.61 } 14.07
Greatest daily range - - - - -28.8 from 4 P.M on 22nd, to A.M. of 23rd.

Warmest day - - 28th - - - Mean Temperature - 57.05 } Difference:
Coldest day - - - 14th - - - Mean Temperature - 33.37 } 23.68

The "Means" are derived from six observations daily, viz., at 6 and 8 A. M., and 2, 4, 10 and 12, P. M.

April 5th—Frogs first heard.

Fine displays of Aurora on the 6th and 29th. Lunar Halo on 15th.

An Earthquake is stated, on good authority, to have been felt at Toronto, about 5 A. M., on the 28th. Seven distinct shocks were perceived. Any person who noticed this will please communicate it to the Observatory.

Possible to see Aurora on 12 nights. Aurora actually seen on 7 nights.

Comparative Table for April.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity
	°	°	°	°					Miles.
1840	42.70	65.9	25.3	40.6	14	3.420	2	--	--
1841	39.40	62.9	22.1	40.8	3	1.370	3	--	--
1842	43.40	89.5	21.6	67.9	8	3.740	2	--	--
1843	41.29	70.0	15.1	54.9	7	3.185	3	0.1	--
1844	48.11	74.5	17.2	57.3	10	1.515	1	Inap	--
1845	42.13	66.0	14.8	51.2	11	3.299	4	1.5	--
1846	44.11	79.4	24.4	55.0	10	1.309	2	1.3	--
1847	39.06	65.6	8.4	57.2	8	2.870	2	4.0	--
1848	40.67	65.4	25.5	38.9	5	1.455	1	0.5	4.89
1849	38.74	70.9	23.2	47.7	10	2.655	2	1.7	7.59
1850	38.30	63.2	18.2	45.0	7	4.729	2	1.1	7.64
1851	41.67	59.2	25.8	33.4	11	2.295	3	1.2	8.07
1852	38.29	53.8	19.8	34.0	6	1.999	4	9.4	6.68
1853	41.92	65.7	27.0	38.7	10	2.625	1	1.0	5.20
M'n	41.41	68.00	20.67	47.32	8.6	2.602	2.3	1.98	6.66

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, April, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

*Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 ft.**

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Velocity in Miles per Hour.			Rain in Inch.	Snow in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2. P.M.	10P.M.	6 A. M.	2 P. M.	10P.M.	6 A.M.	2 P. M.	10P.M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10P.M			6 A. M.	2 P. M.	10 P. M.	
1	29.593	2.6 4	29.739	35	53	32	.155	.294	.160	.69	.72	.80	N E b N	S b E	N b E	10.00	5.15	0.98			Clear.	Clear.	Clear.	Swallows fi'st seen Z. Light; Au'a B's.
2	.891	.867	.847	30	51	29	.145	.216	.152	.78	.55	.85	N E	SW b W	SW b S	0.10	0.23	1.40			Clear.	Clear.	C.Z.; HH	Zod'al light diffused.
3	.788	.674	.580	36	59	39	.161	.321	.240	.69	.64	.95	S W b S	SW b S	S b W	2.00	2.64	0.97			Cir. C. 6.	C. Str. 7.	Z.C.; HH.	
4	.490	.296	.151	35	49	35	.213	.290	.222	.96	.80	1.00	S S E	E	N E b E	0. 6	0.7	0.27	0.410		C.C. St. 4	Str. 10.	Rain.	Rain com. 3.20 p. m.
5	28.897	28.735	28.962	34	38	38	.214	.246	.207	1.00	1.00	.84	N E	NW b W	NW b W	10.33	9.42	19.36	1.690		S.&M Sn.	Rain.	Cl'r in Z.	do. cea'd 4 p m, A. ft.
6	29.299	29.476	29.538	27	50	28	.138	.304	.144	.82	.81	.83	W	W	N W	15.72	4.77	5.70			Clear.	Clear.	Clear.	Z. Light; Aur. Bor'ls.
7	.596	.580	.573	23	50	31	.144	.240	.185	1.00	.64	.96	W N W	W S W	SW b W	5.33	5.25	4.45			Clear.	Clear.	Clear.	Zo'cal Light, bright.
8	.623	.431	.288	31	55	40	.171	.351	.250	.89	.79	.96	S W	S b E	S b E	0.94	4.22	6.00			Clear.	CumStr.4	Overcast.	Sl. Rain, 6 p.m. in n't.
9	.210	.294	.479	40	51	38	.245	.260	.226	.92	.69	.91	W S W	W S W	W S W	13.33	11.75	10.29	0.126		Clear.	Strat. 2.	Overcast.	
10	.594	.684	.809	36	41	27	.210	.220	.149	.91	.81	.89	NW b N	NW b W	NW b W	4.80	8.51	8.20		Inap.	Sl. Snow.	CumStr.4	Clear.	Low faint au'ra arch.
11	.959	.918	.845	28	53	35	.146	.280	.203	.85	.68	.91	NW b W	S S W	S W	0.49	3.75	2.81			Clear.	Cirr. 2.	Overcast.	
12	.724	.60	.612	39	41	38	.241	.253	.246	.95	.92	1.00	S b W	S b W	N W	4.19	1.41	4.12	Inap.		Str. 10.	Sl't.Rain.	Hazy.	
13	.784	.706	.685	38	54	36	.207	.291	.216	.84	.68	.91	N E b N	N E b E	E	5.39	3.79	0.71			Clear.	Hazy.	Str. 4.	
14	.610	.640	.754	26	41	27	.129	.253	.156	.80	.92	.94	N E b N	N E b N	W N W	21.85	12.00	9.87		1.50	Snow.	Str. 10.	CumStr.4	
15	.935	.927	.964	27	45.5	28.5	.112	.253	.153	.67	.80	.88	NW b W	W b S	W b S	3.38	5.81	6.22			Clear.	Cir. C. 4.	Clear.	1st boat ar. Montreal.
16	.965	.904	.839	29	55	36	.152	.312	.230	.85	.70	1.00	S W	SW b S	S b W	2.07	2.51	1.77			Cir. C. 6.	CumStr2	Clear.	
17	.901	.832	.836	35	46	31	.186	.226	.192	.83	.69	1.00	N E	N E	N E	3.67	4.32	0.37			C.C. St. 4	Clear.	Clear.	
18	.960	.764	.709	28	53	39	.144	.293	.234	.83	.70	.91	NW b W	W S W	W S W	1.36	0.40	0.52			Clear.	Clear.	Clear.	
19	.741	.614	.583	37	55	42	.222	.312	.263	.95	.70	.92	W S W	W S W	W b S	6.86	5.87	5.87			Clear.	Clear.	Clear.	
20	.652	.574	.703	43	70.5	46	.233	.568	.303	.79	.78	.93	W S W	W S W	N N E	2.50	5.37	1.62			Clear.	Clear.	Clear.	
21	.839	.759	.657	39	68	50	.214	.445	.330	.84	.65	.89	N E	SW b W	SW b W	0.75	0.23	0.20			Clear.	Clear.	Cirr. 4.	
22	.532	.141	.090	47	51	45	.291	.361	.315	.86	.93	1.00	S W b W	SW b W	N N E	0.80	1.24	3.21	0.570		Str. 10.	CumStr 8	Rain.	Thunder at 11.30 am.
23	.613	.700	.716	31	44	33	.152	.270	.197	.78	.90	.95	N b W	N b W	N W	4.15	16.21	12.29	0.220		Clear.	Clear.	Clear.	Frogs first heard.
24	.872	.804	.739	34	51	38	.178	.315	.230	.83	.81	.95	W b N	W b S	W	0.70	0.08	0.12			Clear.	Clear.	Clear.	1st ship ariv. Quebec.
25	.8 1	.724	.741	32	38	28	.182	.240	.173	.93	.96	1.00	N E	N E	NW b W	0.9	Calm.	Calm.			Clear.	Str 10.	Str. 10.	
26	.814	.7 8	.700	36	57	46	.220	.380	.326	.96	.81	1.00	W	W	W b N	0.51	2.50	3.76			CumStr4	Clear.	Clear.	Zo'cal Light, bright
27	.727	.671	.679	43	73	62	.272	.628	.421	.92	.78	.75	S W	S W	S W	0 33	8.33	14.69			CumStr4	CumStr.6	C. Str. 10.	
28	.754	.697	.713	58	80	54	.437	.760	.418	.89	.77	.96	S W	W b S	N E b E	4.12	4.30	3 39			Clear.	C. Str. 4.	Str. 4.	
29	.592	.649	.727	47	50	46	.357	.352	.326	1.00	.98	1.00	N E	N E	N W	6.02	4.12	5.31	0.570		Str. 8.	Str. 10.	Str. 4.	Rain at 9, a. m.
30	.854	.916	.915	36	49	36	.215	.336	.230	.96	.93	1.00	N b W	W N W	N W	1.43	11.35	8.02			Clear.	Clear.	Clear.	

Barometer.	Highest, the 16th day - - - - - -	29.965
	Lowest, the 5th day - - - - - -	28.735
	Monthly Mean - - - - - - -	29.654
	" Range - - - - - - -	1.230
Thermometer	Highest, the 28th day - - - - -	80.°0
	Lowest, the 7th day - - - - -	21.0
	Monthly Mean - - - - - -	41.36
	" Range - - - - - - -	59.00

Mean of Humidity—.858.

Greatest Intensity of the Sun's Rays—92.°0.

Amount of Evaporation—1.80 inches.

Most Prevalent wind—N. E.

Least do. do. S. S. W.

Most Windy Day—the 14th day, mean—14.58 miles per hour

Least Windy Day—25th mean—0.30 miles per hour.

Rain fell on 6 days—amounting to 3.586 inches, and was accompanied by thunder on one day.

Snow fell on 1 day—amounting to 1.50 inches.

Aurora Borealis visible at observation hour, on 4 nights.

Zodiacal Light visible on 5 nights.

The Electrical state of the Atmosphere, has been remarkable for a constant and very high Intensity of *Positive* Electricity. The Ozoneometer indicated a very small amount of Ozone.

Eastern Townships.—It is not, perhaps, generally known to the public that our Provincial Geologist, Mr. Logan, has discovered materials very abundantly existing in our vicinity, so admirably adapted for the manufacture of every description of Earthenware and Glass, that a company organised for the purpose of testing the facts are only wanted to produce, according to Mr. Logan and other practical men's assurance, articles in these species of manufacture of a most superior texture and usefulness, and in abundance for export and home consumption, the production of which would, most probably, contribute towards the permanent prosperity of Sherbrooke, more than even the discovery of the auriferous deposits rich as they may be said to be found in several localities in our neighbourhood. Besides these there has been discovered lately marble of various kinds, and most superior description, suited for tombstones, mantle pieces, &c., and when I mention further, that in addition to these, Gypsum has been found to a very considerable extent in Oxford, an article hitherto imported principally from Nova Scotia, and that men of some practical experience, and at the same time possessing capital, are living in our midst, it cannot be considered too sanguine to expect that influential gentlemen will be found, during the absence of Mr. Galt in England, ready to take the initiatory before organizing. The British American Land Company have very recently, through their Chief Commissioner, signified more than usual solicitude towards establishing every species of manufacturing industry in our Town; by liberally affording every facility to the utmost extent that water privileges and aid in money can be warrantably advanced to men of practical skill and enterprise, to render Sherbrooke what nature has destined it to be, the great workshop and manufacturing Lowell of Canada.—*Cor. of the Sherbrooke Gazette.*

The Metal Trade of the United Kingdom.—The total declared value of the exports of various descriptions of metals during the month and 12 months, ending with the 5th January, is as follows:—

Years.	For the month.	For 12 months.
1853	£327,102	£9,928,405
1852	509,358	8,918,124
1851	627,354	8,767,646

These figures show an extraordinary expansion of the export trade in metals; and one of the most remarkable results consists in the fact, that in the last month the movement has been more marked than ever before known. It may be fairly assumed that the export of metals for the current year will be larger than any known in the annals of our commerce. The increase on the corresponding month of 1852 is no less than £318,744, or 62 per cent. The general increase in this branch of trade is the more worthy of notice, when it is considered that the prices of all descriptions of metals have during the last year experienced an almost unexampled rise, a circumstance which ordinarily has the effect of checking foreign demand. On a more minute analysis of the returns, we find that this check has been actually perceptible in the articles of copper, lead, and tin, but that the present tendency of these items is now in the direction of a rally, the chief increase is in the article which has also been marked by the greatest rise in price—iron. The augmentation in the shipments of this metal during the last month, more especially, is calculated to excite great attention, and fully bears out the anticipations indulged in by us on several occasions. The exports of this metal are shown below:—

Years.	For the month.	For 12 months.
1853	£530,269	£6,155,600
1852	297,588	5,414,383
1851	305,314	4,056,308

This demand is mainly owing to the vast railway works which are now being carried on by our enterprising capitalists in so many parts of the world. In fact, a large portion of the money which we have lately subscribed to foreign and colonial railway projects never leaves the country at all, but is at once invested in railway iron. Again, a large portion of the American and other railway bonds lately taken up here have been paid for in our iron. The declared value of the shipments is of course increased by the enhanced prices now current for metals; but after making due allowance for this, we have still evidence of an unexampled foreign and colonial demand. The demand for iron ship-building and iron houses, is also exercising an important influence. The present position of the market for this metal is exciting so much attention, that these returns are invested with additional interest. The exports of copper of all kinds for the month and 12 months are thus stated:—

Years.	For the month.	For 12 months.
1853	£148,609	£1,612,732
1852	90,503	1,535,931
1851	172,747	1,851,495

In the twelve months the exports of tin have been to the extent of £83,608, against £80,047, in the corresponding period ending the 5th January, 1852, and £124,798 in 1851. Those of tin plates have been £1,103,317 against £1,020,206 and £927,202; and those of lead £353,101 against £344,315 and £387,394.

Mr. W. Pringle, of Edinburgh, writes to the Phil. Mag., the following singular account:—

"On February 20th, 1846, about 10 P. M., when looking from an eastern window, I observed a very splendid Arch in the Heavens. Its open was situated some degrees south of the zinth, its direction being nearly at right angles to the magnetic meridian. While gazing at it I was astonished to see a portion of the eastern limb at a height of about 45 deg. or 50 deg., suddenly change its character and aspect, and for an extent of perhaps 5 deg., exhibit the spectacle of a crowd of minute meteors rushing and commingling with one another; each individually, so far as the eye could detect for the rapidity and confusion of their motions, precisely resembling an ordinary shooting star, having an apparent nucleus and a luminous train following it. This sight lasted, it may be, nearly a minute. The portion of the luminous boa thus occupied was strictly confined in breadth to that of the arch: there was an obvious motion of the luminous matter of the arch itself from East to West, resembling a tremulous stream, and the cometary projections followed the same course while they lasted.

Obituary.

Von Buch.—This eminent geologist died at Berlin, on the 4th of March, aged 79 years. The following is a letter from Humboldt to Sir R. I. Murchison, announcing his death, (Athenæum, No. 1924.)

"That I should be destined—I, an old man of eighty-three—to announce to you, dear Sir Roderick, the saddest news that I could have to convey:—to you for whom M. De Buch professed a friendship so tender, and to the many admirers of his genius, his vast labours, and his noble character! Leopold De Buch was taken from us this morning by typhoid fever, so violent in its attack that two days only of danger warned us. He was at my house so lately as the 26th [ult.,] despite the snow and the distance between us, talking geology with the most lively interest. That evening he went into society; and on Sunday and Monday (the 27th and 28th) he camplained of a feverish attack, which he believed to be caused by a large chilblain swelling from which he had suffered for years. The inflammation required the application of leeches, but the pain and the fever increased. He was speechless for forty-eight hours. * * He died surrounded by his friends,—most of whom knew nothing of his danger till Wednesday evening, the 2nd of March.

"He and I were united by a friendship of sixty-three years,—a friendship which never knew interruption. I found him in 1791, in Werner's house in Freiburgh, when I entered the School of Mines. We were together in Italy, in Switzerland, in France,—four months in Saltzburg. M. De Buch was not only one of the great illustrations of his age,—he was a man of a noble soul. His mind left a track of light wherever it passed. Always in contact with Nature herself, he could well boast of having extended the limits of geological science. I grieve for him profoundly,—without him I feel desolate. I consulted him as a master; and his affection (like that of Gay Lussac and that of Arago who were also his friends) sustained me in my labours. He was four years my junior,—and nothing forewarned me of this misfortune. It is not at the distance of a few hours only from such a loss, that I can say more respecting it. Pity me,—and accept the homage of my profound respect and affectionate devotion."

THE CANADIAN JOURNAL.

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The entrance Fee (including one year's subscription) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labor, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal;* and an acquaintance with the improvement in Art and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable and, to say the least, a patriotic undertaking,—a wish to encourage a Society where men of all shades of religion or politics may meet on the same friendly grounds: nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute.

THE CANADIAN JOURNAL,

A REPERTORY OF

INDUSTRY, SCIENCE, AND ART;

AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, JUNE, 1853.

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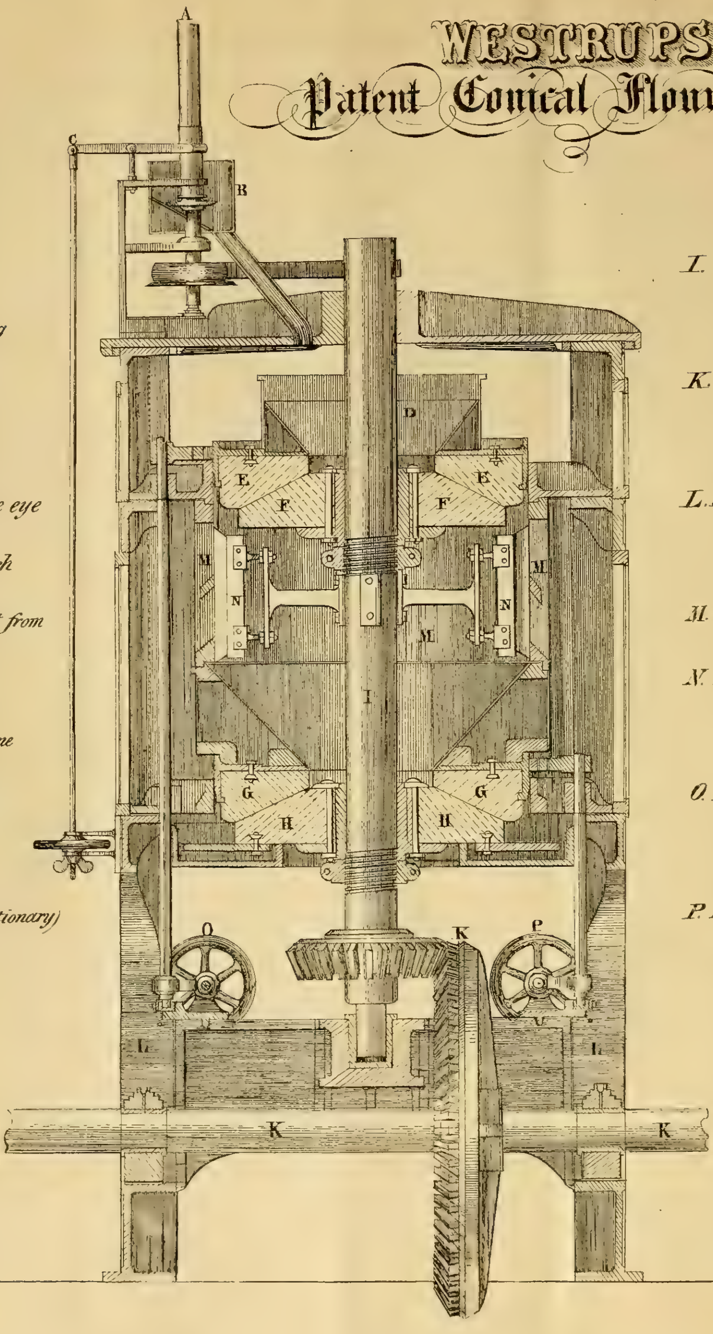
All Communications to be addressed to the Editor of the *Canadian Journal*, Toronto. Remittances to be sent to the Treasurer of the Canadian Institute.

WESTRUPS
Patent Conical Flour Mill.



A. Feed Pipe

B. Chamber containing feed regulator.

C. Feed regulator

D. Chamber over the eye of the Stones which receives the Wheat from the regulator.

E. Upper top Mill stone (stationary.

F. Upper runner.

G. Lower top stone (stationary)

H. Lower runner

I. Spindles upon which runners are hung.

K. Bevil Wheels and Driving Shaft.

L. Iron Frame sustaining the Whole Machine

M. Upright Wire Cylinder

N. Brushes acting upon the Wire Cylinder.

O. Regulator for adjusting the upper pair of Stones

P. Regulator for adjusting the lower pair of Stones.

SCALE.

In. 12 9 6 3 0 1 2 3 4 5

Hugh Scobie Lith. Toronto

The Canadian Journal.

TORONTO, JUNE, 1853.

Correspondence Relating to the Mineral Wealth of Nova Scotia.

We warmly commend to the attention of the readers of this Journal, the following important communication from Mr. Millett, of Penzance, Cornwall, England, on the Mineral Wealth of Nova Scotia. We are aware that for some time past the reported existence of extensive beds of very pure copper ore, has attracted the notice of a wealthy English Mining Company, and that several gentlemen have been sent out at different periods to Nova Scotia for the purpose of acquiring, if possible, correct information in relation to the distribution and abundance of a variety of copper ore, called "purple copper." The exertions of the gentlemen heretofore engaged in the search do not appear to have been rewarded with the success they anticipated; but, as the letter of Mr. Millett shows, that gentleman has succeeded in discovering a large variety of minerals possessing great economic value, and destined to be of the utmost importance to the sister Province.

Steamship "Niagara," at Sea,
21st April, 1853.

To the Editor of the Canadian Journal.

Sir,—The existence of your very valuable Journal has just come to my knowledge, through the instrumentality of one of your earliest supporters and contributors; and associated as I am in my native County (Cornwall) with institutions, kindred in feeling and object, you will, I feel assured, pardon my troubling you with a few hasty notes, of an equally hasty visit to the Province of Nova Scotia, from which I am now returning (having departed from England only on the 19th ult.,) but which, I fear, will scarcely be worthy your notice.

Although an ardent admirer of, and, to some extent, a rather active promoter of the science of Natural History, the present inclement season of the year precludes the possibility of my contributing anything in this department. I would mention, however, one fact which came under my notice (on the 2nd instant) and much surprised me.

Being detained by an accident which happened to our carriage, at Schultz's Hotel, on the Grand Lake, I availed myself of the opportunity of looking into the neighbouring Forest, more particularly in quest of Ferns and Birds. The day was bright and the sun warm, and on a bank, in a sheltered dell, I surprised two beautiful Butterflies, sporting with all the life and activity of a Summer's day. I endeavoured, in vain, to catch them, their alertness baffling every attempt I made to do so.

Such an early appearance of this delicate insect, would occasion surprise in the southern parts of England; the greater, therefore, was it to myself in Nova Scotia, where Winter still existed, and the frost held entire dominion of the country.

I know not whether this occurrence is rare, or otherwise, in the locality in question; but I mention it with the idea that it may prove interesting to some of your readers, who may be pursuing the very delightful study of Entomology.

The occasion of my late visit to the Province being confined exclusively to the examination of certain of its Mineral Districts, a cursory glance at these, from the new and intense interest excited, both in England and there, on the subject, may prove acceptable to you at this moment; but, in doing so, I must speak generally, rather than in detail, of such Mineral Deposits as came under my observation.

My examinations have been confined to parts of the country lying North of the Basin of Minas, following the courses of several of the principal Rivers discharging themselves into its waters, and to the tributaries flowing into those Rivers.

From the vast extent of primitive Forest with which the whole district, forming the Mountain Range, is here covered, no other means are available for accurately examining the Mineral property it embraces. Nature, in most instances, having so arranged the courses of the Rivers as to operate as cross-cuts for the various deposits; which are thus exhibited on their banks or beds.

The existence of Coal and Iron in various parts of the Province, and in quantity and quality most bountiful and rare, is a fact patent in itself. Every day, however (from the recent explorations), adds to, and strengthens these two great elements of Human Industry and Wealth; and no limit can possibly be assigned to their extent.

The presence also of the more valuable Metallic Minerals, such as Copper, Lead, Zinc, Manganese, Sulphate of Barytes, &c., are now proved to be coëxistent with them. From the very limited operations, however, yet pursued, no data can, at present, be given to their respective extent. Metalliferous Rocks and Matrixes of the most kindly and suitable nature for their production, on a large scale, abound. *Marbles* of the purest and most compact nature, both of the White (Statuary) and Variegated, of the most beautiful and varied characters, appear to be bountifully supplied to this particular District; whilst Lime, Gypsum, Freestone, and other equally valuable products, appear scattered over various parts of it, in quantities inexhaustible, and qualities not to be surpassed.

The Barytes, Marble, Copper, Iron, and many other Mineral Deposits, I visited in the Five Islands District of the Province, far exceeded my most sanguine anticipations; and, notwithstanding the extreme difficulties I had to contend with, in consequence of the swollen state of the Rivers, the accumulation of Ice on their banks, and the Quantity of Snow remaining in the Forest, I found abundant evidence that Nature had here scattered her Mineral bounties with a most prolific hand, and that Capital and Energy combined, were alone wanting to develope the resources, and add immensely to the wealth of this highly favoured, but long neglected Country.

From the very numerous veins of Barytes already exposed to view in the banks, and their continuance through the beds of the Rivers and Tributaries, there is abundant proof that this valuable Mineral exists, in this locality, to a very considerable extent.

The greater portion of what I saw was of the purest nature, and might be rendered Merchantable at a very moderate expense; whilst other portions were slightly stained with Red Oxyde of Iron, which may be easily and economically removed before disposed of in the Market.

The various purposes for which it is applicable, in a commercial point of view, cannot fail to make it an article of considerable demand; and Markets for its disposal, when its purity and abundance of supply become generally known, will most readily be found.

The quantities hitherto exported from hence, have been so

limited, and the supply so uncertain, that the article is comparatively unknown in the Market, and has been consequently confined to a few hands. But by an extension of the operations, from a proper employment of Capital, a very large and constant supply may be kept up with the mercantile community, and with the greatest facility.

Veins of Specular Iron Ore, and Copper Pyrites, occur in the same Strata as the Barytes; and the latter may be very properly looked on, if not as a Matrix, still as a very strong indication of the co-existence of other Metalliferous Deposits occupying the same channel of ground.

This is a feature of considerable importance in a mining point, of view; as the operations to be directed, in the first instance, to the Barytes most necessarily tend to the development of the Iron and Copper, and may thus be extended, by the same staff of operatives, to the working of the latter Minerals upon the most cheap and effective scale.

Their quality is undeniably rich, but nothing whatever appears to be known, at present, of their extent. From the regularity and size, of the Lodes however, already exhibited in the Banks and beds of the Rivers; added to the exceeding favourable nature of the accompanying strata, little doubt can exist (judging from parallel cases) that they are to be found here in large and productive quantities.

Rich specimens of Zinc and Manganese, are to be found likewise in this immediate locality, evidencing their presence also. But none of these deposits came under my notice, from the natural impediments before mentioned. Such specimens, however, were handed me by the inhabitants who had picked them up in the bed of the river in the summer season.

Of the various Marble beds or deposits in the Five Islands District, the *white* most undoubtedly take the pre-eminence; although the variegated, from their variety, beauty, and compactness, must always stand very high in the scale.

The White Marble is of the finest quality for purity and grain; having been pronounced by a most eminent Statuary, to combine all the requisite characteristics for the most delicate and enduring works of art. Judging from the appearances of the several beds partially opened on; and their length and breadth, traceable on the surface in the forest, and in the bed of the contiguous river, there can be no question that this most prized and valuable article, exists (in situ) here, to an extent little suspected by any one, and now, for the first time, to be developed to the world.

The Variegated Marbles present several very distinct varieties; amongst the most prominent are a most delicate Lilac (or Amethyst) ground, combined with a soft yellow, or gold colour. A pure Lilac, with a trifling admixture.

And a Lilac, blended with green, varying in deep and light shades. The former and latter of these represent a *Giallo Antico* and *Verd Antique*, of a true and unmistakeable character—involving (from their beauty) the utmost difficulty in deciding to which the palm for merit and value should be awarded.

Property, of such intrinsic value as these, can no longer be allowed to remain buried, and unknown in the bowels of the earth; and the surprise to myself is, how they can have so long escaped the prying eye of man, and wasted their hidden treasures in the desert air.

Nature has so arranged and placed these beds in the river bank, (here assuming a height of several hundred feet) as to render their being quarried with the utmost ease and cheapness. And the more so, from their immediate contiguity to each other The Layers or beds of the material lie horizontally in the face of the bank; and, judging from their compactness and nature, blocks of very large size will no doubt easily be worked out.

Harbours embracing the most advantageous positions, are everywhere almost in contact with the Mineral Districts, to which access is easy, in most cases, by gentle inclinations; and shipping for the exportation of metals or minerals abundant; and freight moderate.

The Province, from the cursory view I was enabled to take of it, appears to be bountifully supplied by Providence with wood and water, and to comprise, generally, an undulating country of upland and interval; the latter, particularly in the Truro, Onslow, Economy, and Five Islands Districts, abounding in alluvial soils of the richest description.

From the ungenial season of the year, when nature had put on her most sombre mantle—the vegetable world appeared to the least advantage to the visitor. But enough was apparent to satisfy me, that, in a few months, a total change will have overspread the scene—and that few countries can boast of greater luxuriance or beauty.

The geographical position of the Province, placed as it is, between two immensely populous and consuming quarters of the globe (Europe and America) gives it an undeniable advantage over almost every other portion of the civilized world—and *unity of purpose amongst its inhabitants;* rapid internal communication by *Railroads* (one of which latter I am happy to find, is now in actual progress, and which will, in effect, be the *Lung* giving vitality to the whole—and a main artery through which the enterprise, spirit and commercial wealth of those two most important communities must directly circulate,) and *Capital* alone, are wanting to render it most wealthy and prosperous.

I cannot conclude these hasty notes without expressing my great obligations for the uniform kindness and attention, I received at the hands of all classes of the inhabitants, (from His Excellency the Governor of the Province, to the Native Indian in his primitive Wigwam,) during my very short sojourn amongst them,—bearing out, in the fullest sense, the high character for hospitality and kindly feeling, which I had been led to anticipate from them, previously to my quitting the British Shores.

I beg to apologize for the length of this communication, which I had intended to have made much more concise, but the very great interest and importance of the subject, have led me unwittingly on.

It will afford me much pleasure to transmit to you, the published transactions of the "Penzance Natural History and Antiquarian Society," and to receive from you a copy of your's in exchange.

I am, Sir,

Your most obedient Servant,

JNO. R. A. MILLETT.

Electric Light, and Colour Manufacture.

We have perused a little pamphlet, just issued from the press, on Electrical illumination by J. J. W. Watson, Ph. D., F. G. S, &c. It gives a clear and succinct account of the process of discovery, which, according to the author, has resulted not only in the realization of the long-sought desiderata—viz., an economic and a continuous electric light—but also in the discovery of a

new mode of manufacturing colours, at a cost so insignificant as to ensure a ready and inexhaustible market. These are features of exciting interest; and, if fully realised as promised, must undoubtedly be attended with important consequences, by revolutionizing the world of light and of colour.

Mr. Watson freely acknowledges what is due to other electricians. He admits that Professor Daniel's galvanic battery is distinguished for producing a continuous light; but from the expense of maintaining the action it could never be profitably applied to common uses, and was, therefore, a costly ornament, not a marketable commodity. This great distinction is, of course, fatal to its utility for the purposes of every day life. Strongly influenced by this impression, Mr. Watson turned his whole attention to the finding of means of producing this light at a small cost. We are informed that he has fully succeeded in his object; that he can produce and maintain this splendid light continuously for any required length of time, not only without cost, but actually at a profit, by the aid of a chemical transformation of the elements used in the working of the battery. These elements have hitherto consisted almost entirely of the common mineral acids, zinc and copper: occasionally iron, lead, and tin were used, but sparingly, and without any important acknowledged results. Mr. Watson's new agents, or electrolytes, are only five in number, and from these he produces no less than 100 valuable paints or pigments, of a superior quality and character, surpassing in marketable value the articles from which they are produced, and by which the light also is fed. It is, in fact, maintained that not only is the light thus created without cost, but absolutely at a profit, by the additional convertible value of the elements transformed by the chemical process. The mode also of producing these colours is asserted to be not by any subsequent mixture of the elements, but results from the actual development of the electricity in the battery, the materials employed also aiding in the galvanic effect by giving constancy, from the want of which united recommendations as Mr. Watson observes, the best form of batteries at present in use are absolutely worthless for a practical purpose such as lighting.

The nature of the action thus produced, and the mode of the process observed, is then touched on. We were also informed that the Maynooth battery is the great favorite with electrical experimentors, and that all the successful exhibitions of the electrical light have been made with this battery. Without changing its form, Mr. Watson has endeavoured to supply its deficiencies, and render economical its working.

He says: "Prussiate of potash, or, as it is known to chemists, ferro-cyanide of potassium, gives with the salts of iron a most splendid blue pigment.—Prussian blue; which, when pure, is of the greatest possible value. In the Maynooth battery we employ the prussiate of potash thus: to the iron cell we add prussiate of potash, and to the zinc cell also the same salt, although we restrict the quantity greatly, for reasons which need not be described here, but which to those having any acquaintance with the nature of galvanic arrangements will be at once apparent. Our products are Prussian blue, of a quality and colour equal, or as we have been disinterestedly informed by those deal in the article, far superior to any in the market. Our other product is a peculiar blue pigment, of a colour resembling, and from specimens which may be seen at our manufactory at Wandsworth, closely vying with the artificial ultramarines. This pigment, from its chemical constitution, as proved by our analyses, we have termed the ferro-prussiate of zinc. The insoluble nature of these pigments, and their consequent removal from the galvanic circuit by precipitation, gives to the Maynooth battery a greater constancy, as we have before described, than there remains to it in its normal state. In addition to rendering profitable the working of the battery, the prussiate of potash has a distinct galvanic action, in the manner before described.

"The discoverer of the Maynooth battery is also the inventor of another form of battery, of which we also have availed ourselves for making colours. This form consists of platinised lead and zinc, arranged precisely in the manner of a Smee's battery, and is similarly excited by nitro-sulphuric acid. In this battery our pigments are chrome yellows, produced by adding the bi-chromate of potash precisely in the same manner as with the prussiate of potash. The depth and tint of the pigments, which with chromes constitute their value in the market, we vary with the proportion of the salt added. As regards the galvanic effects of the bi-chromate of potash, it is precisely the same as with the prussiate of potash.

"The power of the two forms of battery just described, and their applicability to the purposes of electrical illumination, from their constancy and intensity, will be best appreciated when it is stated that a platinised lead battery is about fifteen times as powerful as a common Wollaston battery of the same size. A cast-iron battery is a little less powerful than the platinised lead one, but it is cheaper in its first erection, since the iron plates do not require to be platinised. Three platinised lead batteries excited by a solution of nitre and sulphuric acid, or three cast-iron batteries excited by nitric and sulphuric acid, will afford the most brilliant light, equal, at least, to 300 wax candles, whilst it requires 160 cells of Daniel's constant battery, or 250 of the ordinary Wollaston battery, to effect the same object. Three of the lead or iron batteries will occupy just one-sixth the space occupied by Daniel's arrangement, and one-twelfth of what is occupied by Wollaston's.

"The expense of constructing a platinised lead or iron battery is far less than any of the other forms of battery in use. For instance, a platinised lead or a plate of cast iron, of an efficient size, may be had for 1s., whilst a platina plate of the same dimensions will cost nearly £3. Moreover, a platinised lead or cast-iron battery, without any of the means by which we have effected an economy, may be worked for one hour with a resultant of the same power for one-tenth part of the expense of working a Grove's battery for the same time.

"In addition to the cast iron and platinised lead batteries, we employ a third form, which is identical in arrangement with the old form of Wollaston battery, but free from the defects of that instrument. The sulphate of zinc, which usually attaches itself in the form of metallic zinc to the copper-plate in Wollaston's arrangement, after the battery has been in action a short time, we find is carried down as a splendid blue pigment, much resembling the better description of "smalts," by adding prussiate of potash; hence the constancy of the battery is maintained so long as any fresh acid remains in the cells.

"It will be easy to perceive that if prussiate of potash gives with iron a blue colour, and chromate of potash with zinc a yellow, that if these salts be added in a battery of iron and zinc—the prussiate to the iron and the chromate to the zinc, the resulting products having access to each other through a diaphragm—the colour produced will be a green, of a depth of tint dependent on the quantity of the two normal colours forming the compound. In like manner, by adding prussiate of potash to the lead battery, a white pigment is produced of great body, and perfectly free from the fault of blackening by exposure to sulphuretted hydrogen, the zinc seeming to act as a protective agent. If chromate of potash alone be added to the iron battery, a deep brown colour is produced. Lastly, if lime be added, with chromate of potash, to the lead battery, a red pigment is produced, of great brilliancy and body.

"Our arrangements for filling our batteries, and drawing off the products as they are formed, are simple in design, and perfectly efficacious in practice; they consist to describe them generally, in a well-arranged system of gutta percha piping, troughs and taps. Our aim in dealing with the difficult matter of making the experimental apparatus of the lecture-room the working instrument of practice, has been to establish a thorough system of electrical engineering; and with what success will be best seen by a visit to our manufactory.

"We have now to deal with the other products of our batteries, not pigments; and although we feel great difficulty in placing this part of the subject in a garb sufficiently popular to be easily comprehended, we consider it necessary to advert to it, to render more clear what we may describe as the "profitable" portion of our invention.

"During the working of certain forms of our batteries large quantities, especially when we use nitric acid, of nitrous fumes are given off; these fumes we convey into appropriate chambers and apparatus, and convert to the following uses:—The production of nitrate of potash, and the production of sulphuric acid—substances which it will be seen are made use of in originally exciting the batteries. The hydrogen which escapes from the zinc cells we also profitably employ for the manufacture of acetic ether and ammonia. The pigments, when removed from the batteries, carry with them, of course, a large quantity of spent acid solution. This we profitably employ, after the manner described in our specification, for the manufacture of nitrate of iron, white lead, and plaster of Paris. The acid solutions also contain a large proportion of the salts of potash in the forms of nitrates and sulphates; and these salts are easily separated in the manufacture of the substances just named. It must be remembered that nitrate of potash forms one of the exciting agents in the lead battery, and that, therefore, the saving of this salt is by no means an insignificant feature in the economy of our system. We would, moreover, especially draw attention to the fact, that the potash salts from the prussiates and chromates, added to the batteries for the manufacture of the colours, contribute entirely to the formation of nitre and sulphate of potash, over and above the alkaline salt used as an excitant."

Mr. Watson then comments as follows:—"The difficulty of carrying into the wide and, it may be said, rough fields of practice an invention such as these pages are devoted to, can only be really understood by those who have experienced it. A new field of labour has to be opened, and experience and education can be the only guide of those who may engage in it. Electrical illumination consists not in the mere arrangement of certain galvanic pairs; it requires something more: system, order, and economy, must rule it, as with railways and steam navigation. The successful and permanent institution of telegraphic communication by the same mysterious force, offers the greatest possible inducement for its being taken up in the spirit that it deserves. The laying of the electrical mains, and the arrangement of a system of governors for regulating and measuring the quantity of electricity passing to the different lamps, is as much a matter of engineering as the arrangements of gas and water. It will be easily recognised, we opine, that if the manufacture of the colours which we have described can, in itself, return a profit so large as to constitute a trade monopoly, that the production of the same articles, and the gain of a new power, as an additional source of profit, is a matter worthy of every species of encouragement. We state the proposition thus generally to save ourselves the tedious details of a debtor and creditor statement, although the closest inspection of such that can be given we more than desire and court."

In conclusion Mr. Watson, recapitulates that he is able to produce the electric light steadily and uninterruptedly for any number of hours; that any little inequalities in the action of the battery, which would cause the light to flicker, are entirely removed, and rendered inoperative by his introduction of the magnet as a regulator; that he has the means resident within the lamp itself of increasing or diminishing the light; that the lamp requires no previous adjustment, when the electrode is once fixed, to render it available at a moment's notice; that the electric light has no characters in common with other artificial sources of illumination. It surpasses all other lights in brilliancy. It may be seen from a distance of 30 miles from the place of exhibition; and, what is peculiar, it requires no air to support it, and burns as well under water as it does in vacuo! That for lighthouse purposes it is invaluable. For signalising at sea, ships in convoy, lights of all kinds for vessels, for railway purposes, lighting tunnels, mines, and diving-bells, it has properties and advantages which no other description of light can command. In streets it must, with time and public favour, entirely supersede the use of gas; and for lighting public assembly-rooms, theatres, and spectacles of all kinds, it has only to be made known to ensure its adoption.

Samuelson's Patent Digging Machine.

It is well known that the produce of land cultivated by market gardeners and by cottagers far exceeds that obtained from the same area by the farmer. That excess is obtained chiefly at the expense of increased labour in deep tillage, irrigating, singling, and cleansing. It is only of late that a serious effort has been to assimilate our practice as farmers to that of the gardener. In the growth of root crops the water drill is but just beginning to perform that in the field, the omission of which in the garden would be considered as the height of neglect. In growing corn, we still adhere to the extravagant practice of thick sowing, whether broad cast or by the drill; though we may see in the labourer's allotments how much superior, both in the straw and in the ear, is the crop which he has "dibbled" with one-third the quantity of seed. The value of horse-hoeing is doubted by many who would not allow a weed to remain in their gardens; and we still endeavour to make up by waggon-loads of manure and by tons of guano for imperfect tillage and want of drainage, which permit their most valuable constituents to be washed off the surface into the ditches and streams; whereas by converting our fields by deep tillage into one vast filtering bed for their retention, we should not only avoid this waste, but avail ourselves to the utmost of the valuable dressings that descend with the rains of heaven, the ammonia contained in which, according to our chemists, represents an annual value of quite twenty shillings per acre, estimated at the price of guano.

It is to the element of cultivation, namely the effective pulverization of the soil and preparation of the seed-bed, that Mr. Samuelson the well known agricultural engineer of Banbury, has contributed the invention of his digging machine, which has been for some past at work in that neighbourhood. It consists essentially of several series of slender steel prongs, so shaped in curve and section as to penetrate the soil easily by the mere weight of the framing, which contains them; each series resembling the spokes of a wheel without the tyre, and all the wheels being caused to revolve by the draught of the horses, whilst embedded in the earth up to what may be called their naves. The spokes or prongs bring up the soil, and allow it to fall backward, thoroughly pulverized and mixed, in a form not unlike the backwater from a paddle-wheel. In the upper portion of their revolution they pass between a corresponding number of strong iron bars which scrape away any earth or weeds adhering to

them. Although, like all other tillage implements, it works best in dry weather, the digger was used with advantage during the early spring, when it was hardly possible to plough at all; it also clears itself well of any stones which it may pick out of the ground.

From the description which we have given, it will appear that it is, in fact, a trenching implement, propelled by horses—loosening, and partially bringing the subsoil to the surface, and thoroughly reducing the whole, like the fork; and not merely cleaving off a slice, and reversing it like the plough : but, as it only requires four or five horses to work it when set to dig ten inches deep by three feet in width, being equal to four acres dug in a working day of seven hours, in soils where it is rare to see less than three horses ploughing only one-fourth of that breadth to a depth of barely six inches, it is obvious that, apart from the superiority of the result, there is positive economy in the power applied. Circular motion, which general accompanies the application of steam power, will, we trust, in this instance, as in that of the horse power thrashing machine, prove to be only its precursor; meanwhile, it is perhaps quite as well, with reference to the speedy and general adoption of this new cultivating machine, that its introduction is not dependant, in the first instance, upon that of the steam engine.

In conclusion, we must not omit to notice the application of the "Digger" to works of road formation and excavating generally. It moves as much surface soil in a day as would require forty to sixty men with the spade.

How to tell Gold.

Gold *invariably* exhibits something of the peculiar yellow colour which it is known to possess in a pure state; but this color is modified by various metals with which it may be mixed. Thus it may be described as having various shades of gold-yellow; occasionally approaching silver-white, occasionally resembling brass-yellow of every degree of intensity, and even verging on steel-gray in some specimens from South America.

The lustre of gold is highly metallic and shining, and owing to the small amount of oxidation at its surface, it preserves its shining lustre even after long exposure in contact with other substances. Thus the shining particles are often seen in sand when the quantity is barely sufficient to repay the cost of working notwithstanding the value of the metal. Even, however, if the surface is dull, the true color and appearance is easily restored by rubbing; and when polished it takes a very vivid lustre, which is preserved for a long time in the atmosphere.

Although in the division which has been introduced into the gold-yellow, brass-yellow and grayish yellow, native gold seems, with some slight modifications, to agree with the geological relations of its varieties; yet this mode of arrangement deserves little serious notice. The gold-yellow varieties comprise the specimens of the highest gold-yellow colors, though there are some among them which have rather a pale color; they include most of the crystals and of the imitative shapes, in fact the greater part of the species itself. The brass-yellow native gold is confined to some of the regular and imitative shapes of a pale color, (which is generally called brass-yellow,) and, it is said, has less specific gravity than the preceding one; but this does not seem to have ever been ascertained by direct experiment. The grayish yellow native gold occurs only in those small flat grains which are mixed with the native platina, and possess a yellow color a little inclining to gray; they are said to have the greatest specific gravity of them all. The real foundation of this distribution seems to be the opinion, that the first are the purest, the second mixed with a little silver, and the third with platina. It is not known whether the latter admixture really takes place, but it is certain that several varieties of gold-yellow native gold contain an admixture of silver.

In color and lustre, inexperienced persons might mistake various substances for gold; these are chiefly iron and copper pyrites, but from them it may be readily distinguished, being softer than steel and very malleable; for, although the latter mineral yields easily to the point of a knife, it crumbles when we attempt to cut or hammer it, whereas gold may be separated in thin slices, or beaten out in thin plates by the hammer. There can thus be no possible difficulty in distinguishing these various minerals in a native state, even with nothing but an ordinary steel knife. From any other minerals, as mica, whose presence has also misled some persons, gold is easily known by very simple experiments with a pair of scales, or even by careful washing with water, for gold being much heavier than any other substance found with it, (except platina and one or two extremely rare metals,) will always fall first to the bottom, if shaken in water with mud, while mica will generally be the last material to fall. This is the case however fine or few the particles of either mineral may be.

Gold, therefore, can be distinguished by its relative weight or specific gravity, and by its relative hardness, and from other bodies which resemble it. It is described generally as soft, completely malleable, and more accurately as softer than iron, copper or silver, but harder than tin and lead. It is useful to know facts of this kind, as a simple experiment that can be made with instruments at hand, is often more valuable than a more accurate examination requiring materials not immediately available. Thus, if it is found that a specimen, (perhaps a small scale or spangle,) is readily scratched by silver, copper or iron, and scratches tin and lead, it may, if of the right color, and sinking rapidly in water, be fairly assumed to be gold.

Westrup's Patent Conical Flour Mill, with Plate.

The great interest which this invention has created in the public mind, and its adoption by various foreign States, including France, Belgium, Austria and Mexico, where mills are already erected, justify us in bestowing upon it a short notice. The bold statement to be proved before Parliament, that by the adoption of this mill, out of the same quantity of wheat consumed in England nearly eighty-two millions of quartern loaves per annum in addition may be furnished to the nation, at a money value of upwards of two millions sterling, is a matter of very great importance, exceeding any that can be brought forward by the most expert financier in lessening the national burdens.

As there is frequently in the most plausible and splendid theories, some faults or drawbacks in practice, which cannot be immediately detected, we have waited until practical experiments were made before giving our unqualified support to this invention. There have been now several of such experiments, and the conical mill at Wapping has been at work night and day for some months, supplying customers, who increase, as the Messrs. Pavitt publicly state, beyond all their powers of grinding; hence this invention may be said to be already "a great fact."

The first public experiment was attended by many scientific men, and the reporters of nearly all the daily and weekly journals, who, without a single exception, bear witness to the success and the excellence of Mr. Westrup's invention. We shall conclude

this article by quoting from a scientific weekly contemporary the following report :—

"The old flat flour-mill ordinarily consists of a lower fixed circular stone, and an upper revolving one, each of about 4 ft. 6 in. in diameter. The wheat being introduced through an aperture, is drawn in, and ground between the revolving and the fixed *surfaces*. The average weight of these stones is about 14 cwt., and it is ordinarily found that the grinding surface presented, is so extended as to render the delivery of the flour extremely slow and uncertain, notwithstanding the great velocity of the running stone, which is generally 120 revolutions per minute. The evil arising from this circumstance is, that the flour, finding only a partial escape, is triturated and re-triturated to the great ultimate injury of the meal.

"Some idea of the power required to keep such massive machines in operation may be gathered from the fact, that a single pair of stones, 4 feet in diameter, require the power of a four-horse engine to maintain the needful speed. This enormous power becomes necessary, in consequence of the great weight of the 'top stone,' the rapid rate of revolution, and the very large amount of friction produced by the process of grinding so glutinous a substance as meal between such extended surfaces.

"These are the principal objections to the old flat mill system of grinding, which has been the universal one in use in all parts of the kingdom for a considerable time ; the only variation in practice consisting in the motive power. Most commonly steam power is employed, but when the locality admits of its introduction the cheaper and more uniformly certain agent, water, has been brought into action. In all other respects, the mechanical detail of the system has been uniformly the same.

"The 'conical' mill is intended to obviate these defects ; and a very few remarks will suffice to show that its inventor has not only detected their causes, but has brought into operation a most philosophic, and therefore successful, combination of grinding and separating agencies, by which these defects have disappeared to an extent which leaves little to be desired. The beneficial changes effected may be succintly enumerated. First, the reduction of the weight of the running-stone from 14 cwt. to $1\frac{1}{2}$ cwt., by placing it beneath instead of upon the fixed one; second, the reduction of the size of the stones in the proportion of 3.34 to 1; and thirdly, the giving to the stones a new form—that of the frustum of a cone. The advantage of lessening the diameter and weight of a mass, of which the one is 4 cwt., and the other 14 cwt., will be apparent, when it is considered that its effective velocity is 120 revolutions per minute, and that this velocity must be sustained against the enormous friction of the grinding surfaces. The altered position of the running-stone admits of a much more delicate adjustment of the opposing surfaces, and gives to the miller an easy and effective control over the most important portion of his operation. The conical form facilitates the discharge of the flour, and obviates the clogging and overheating of the old practice. In addition to these advantages, by a judicious modification of the ordinary mode of dressing, or rather by a combination of the mill with the dressing machine, a perfect separation of the flour from the bran is effected at the moment the grist escapes from the stone. The bran still remains in the mill, and falls by its own gravity to a second pair of stones in all respects resembling those already described.

"Both pairs of stones are mounted upon the same spindle, and of course impelled by the same gearing. The operation of the lower pair need not be described; they complete the process, and leave nothing unconverted into flour which could add either to the weight or the quality of the loaf. In considering this arrangement, we cannot fail to be struck with the analogy subsisting between it and that which we observe in the construction of the jaws of animals—a circumstance which assures us of its philosophical superiority.

"There were three trials as regarded the old system and the new. The first experiment on the old mill gave a discharge of 16 ℔ of flour in five minutes, which was equal to 192 ℔ per hour; while upon the patent mill there was a discharge of $38\frac{1}{2}$ ℔ in five minutes, or 462 ℔ per hour. The difference, therefore, on that experiment was, against the old system, 270 ℔ per hour. The second experiment tried was even more favourable as regarded the new system.

"Two conical mills worked against two on the flat principle for an hour, ascertained exactly, and with the following results : Conical mill (No. 1.) produced $8\frac{3}{4}$ bushels ; ditto, No. 2.) $7\frac{3}{4}$ bushels; Flat mill (No. 1.) 3 bushels; ditto, (No. 2.) 3 bushels. (See plate.)

On Fixing Photographic Drawings.

We have received from an amateur, who states he has "never yet seen the productions of any other person," some calotypes, which are to a certain extent successful. They exhibit, however, many of the faults which mark the productions of the inexperienced operator; and we are therefore induced to offer a few suggestions which may be of assistance to our correspondent, and others similarly situated.

In the first place, the specimens before us bear the evidence of having been obtained with a very imperfect lens—we should judge from appearances, a lens which has not been made for a Photographic Camera. Now, the peculiar conditions of the agent by which these pictures are produced, demand the use of lenses which have been constructed with due regard to certain known principles; otherwise a perfectly flat field, and distinctness up to the edges, cannot be obtained.

It is a mistake to attempt to adopt an ordinary lens to a photographic camera; as, by so doing, failure must follow upon failure, and the production of a good photograph is rendered impossible.

Our correspondent complains of the injury which his pictures receive in the process of fixing with the hyposulphite of Soda, and regrets that some more perfect method cannot be discovered.

We believe it will be difficult to discover any chemical agent superior to the hyposulphite of soda, which, when properly employed, ensures the utmost degree of permanence to the photograph under any circumstance of exposure. To place this clearly before our readers is our object.

1. The hyposulphites are remarkable for their property of dissolving several of the salts of silver—such as the chloride and iodide—forming with them compounds which are distinguished by their peculiar sweetness. *Negative* Talbotypes consist of an iodide of silver over all those parts which are not darkened: and of metallic silver in a state of minute division over the darkened portions. Positive pictures only differ from negatives in the general use of the chloride of silver, instead of the iodide. In either case the unchanged silver salt is to be removed, and the darkened portions disturbed as little as possible. In the process of change under the influence of the solar radiations, oxide of silver appears to be formed at first; the oxygen is then liberated and metallic silver is the final result. If much oxide of silver re-

mains on the paper, the hyposulphite of soda will dissolve some portions of it, and thus injure the picture. This is shown by the more energetic action of the hyposulphite on the positive than on the negative pictures. In the latter, by the action of the Gallic acid, or the protosulphate of iron, the complete deoxidation of the silver salt is effected. In the former, this is not the case where the exposure to sunshine has been short, or where the copy has been made by the effect of diffused daylight.

Positive photographs which are made when the sun is shining brilliantly, are far less liable to injury than such as are procured by the weak and uncertain light of a wintry day, although they may in both cases be brought to the same apparent degree of darkness.

2. As a general rule, it is advisable to expose the positive to sunshine longer than it is necessary to do, for the production of a well-defined image. If the picture has been rendered *far too dark* to be pleasant, it can be *toned* back, to use an artistic phrase, by very weak solutions of the iodide or cyanide of pottassium.

3. The photograph being removed from the copying frame, or the camera, should be first placed in some clean water, to which a small quantity of common salt has been added. By this all the free nitrate of silver is converted into a chloride; and the formation of any sulphuret of silver in the paper, by the action of the nitric acid on the sulphur salt, prevented. The picture should, after it has soaked for a little time, be removed and placed in a solution of the hyposulphite of soda, in a flat dish—about an ounce of that salt being dissolved in a quart of water—it should remain in this fluid for five or ten minutes, and then be removed to a vessel of perfectly clean water.

4. It is thought by many photographers that the addition of some chloride of silver to the hyposulphite of soda prevents its acting on the more delicate shadows of the picture. Whether this is the case or not, is somewhat uncertain; but the hyposulphite solution can be used a great many times, if after using it is poured back into a bottle, and kept from the air.

5. It becomes necessary now to remove every trace of the hyposulphite of soda and silver from the paper. Many persons are content with soaking their pictures; but by far the best practice is, to place the photographs upon a flat board, incline it to an angle of about 45 °, and allow water slowly to fall upon and flow off from the pictures. By this means the salt is removed far more rapidly than by soaking and changing the water, howsoever carefully this may be done. Even after this the safest course is, to place the photograph in some clean hot water, to which a little potash has been added. This secures the removal of the last trace of the hyposulphite, and it darkens again those lines of the photograph which may have been injured by chemical action, as above described.

6. By attention to these details photographs may be fixed most permanently, without their undergoing any serious injury. The addition of neutral chloride of gold to the hyposulphite of soda bath, tends to produce a variety of purples approaching almost to black, which are of a very pleasing character. Similar results may be obtained by soaking the picture in a weak solution of the chloride of gold, upon removing it from the fixing fluids.

7. The experience derived from the photographs displayed at our late Photographic Exhibition, some of which have since been presented to the Society, convinces us that sufficient care is not generally given to secure the perfect permanence of a fine positive photograph. By the combined influence of a moist atmosphere and light, changes slowly go on from the edges of the paper spreading inwards, which eventually destroy the picture, if there is the slightest trace of the hyposulphite of silver allowed to remain on the paper. The taste is the best test that we can apply; and if after a picture has been well washed in several perfectly clean waters, we take one corner of it into the mouth and suck out some of the water, without discovering any metallic sweetness, we may be sure that our photograph will endure as long as any ordinary print.—*Journal of the Society of Arts*,

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"On the nutritive value of the food of Man under different conditions of age and employment." By Dr. L. Playfair

The great importance of an attentive consideration to the kinds of food taken under different circumstances becomes evident when it is known that one class of substances supplies the fuel that maintains the heat of the body, and other substances supply the materials that form the flesh and the bones. The lungs act as a furnace, in which the process of slow combustion is always going on by the absorption of oxygen from the air into the blood and the exhalation of a portion of it, in combination with the carbon of that fluid, in the form of carbonic acid. It was stated by Dr. Playfair that the weight of oxygen absorbed by a man in this manner in a year, averages 700 lbs., and that the consumption of carbon during the process is so rapid that in the course of three days all the carbon in the blood would be exhausted, if it were not renewed by a supply of proper food. As the temperature of the body is always the same under every climate, the inhabitants of the colder regions of the earth require a larger amount of food containing carbon than those who live further south, to maintain the heat at its requisite standard. Fire and warm clothing diminishing the want of heat-producing food, therefore it becomes a question, in an economical point of view, whether it is not cheaper as well as better to keep paupers and others who are supported at the national cost, well clothed and in warm rooms, and thus to supply externally by low-priced fuel a portion of the animal heat that would otherwise have to be maintained by the more costly fuel supplied to the stomach as heat-producing food. The substances that contain the greatest amount of carbon are those which best supply heat; among these sugar and rice are prominent; whilst the flesh-giving substances are those that contain nitrogen—meat, peas, and cheese, being the most abundant sources. As different kinds of solid food produce different effects in the nutriment of the body, it is requisite in a well-regulated dietary that the proportions of flesh-giving and heat-producing food should be properly adjusted, taking into consideration age, employment, and climate. The regulations for dieting sailors exhibited, at one time, great ignorance of this requisite attention, and in the dietary equivalents of the navy in some instances, heat-producing food was substituted almost to the exclusion of flesh-giving food, all kinds of solid nutriment being ignorantly considered to operate in the same manner. Dr. Playfair noticed at considerable length the difficulty in obtaining accurate statistical statements of the dietaries of different classes, but he nevertheless exhibited numerous diagrams, representing, by differently coloured lines of various lengths, the respective quantities of food of both kinds allowed to soldiers, sailors, paupers, and prisoners in this and other countries. He pointed out strongly the facts which had come to light during Mr. Chadwick's investigations respecting the relative quantities of nutriment of agricultural labourers and prisoners. From this it appeared that whilst the agricultural labourer had a scanty allowance, scarcely sufficient to maintain vigorous life, the suspected thief was sufficiently fed, the convicted thief was still better treated, and when he arrived at the dignity of a transported convict, he has double the allowance of the hard-working labourer. Dr. Playfair mentioned a curious fact,

which illustrates the inconvenience and mistakes that sometimes arise from a pedantic use of words different from their ordinary acceptations. He had been engaged with others in examining and adjusting the pauper dietaries of different parts of the kingdom, with the view to introduce uniformity in the system, and this laborious process is termed "reducing." When the official report was published, stating that the officers of the Government had been "reducing the pauper dietaries of the kingdom," it was generally supposed to be the intention to "diminish" the amount of food supplied, and such an outcry was raised against the imagined harsh measure that the report was withdrawn. Alluding to the tradition that the entire substance of the body changes in seven years, Dr. Playfair said he could not imagine on what foundation that tradition rests, for judging from the active chemical decompositions and reconstructions going on in the body, it might be assumed that an entire change takes place in forty days rather than in seven years, though some parts must undergo more rapid changes than others. In reference to the much disputed question of the relative values of animal and vegetable food, he observed that, chemically speaking, there could be no difference, for all animals derive their nutriment from vegetable matter, either eaten directly or after it has formed part of the organism of a herbiverous animal. There is, Dr. Playfair maintained, much truth in the observation that the character of a nation, depends upon the food of the people; hence we may attribute the passion for honour and glory in the French and the excitable temperament of the Irish to vegetable diet, whilst the sound sense of the Englishman may be traced to his roast beef and beer. This practical conclusion was arrived at—that the regimen of roast beef and beer should be given to the Irish, as a means of assimilating them in character to the English more than it is probable they can be with a continued potato diet.

On the Structure and Succession of the Lower Palæozoic Rocks of North Wales and part of Shropshire, by Prof. Ramsay.

By means of sections constructed on a scale of 6 inches to a mile, vertically and horizontally, the Harlech Grits were shown to be about 7,000 feet thick. The Lingula flags that overlie them are also 7,000 feet thick. These are overlaid on the north flanks of Cader Idris and the Arans by about 3,000 feet of calcareo-felspathic ashes and conglomerates, inter-stratified with slates. Above these lie the porphyries of the Arans, &c.,—originally sheets of felspathic lava that flowed abroad in the Lower Silurian sea-bottom. Between the Dolgelli and Bala Road and the summit of Aran Mowddwy, nearly the whole thickness of the Lingula flags, ashes, and porphyry is exposed in unbroken succession, and on the north-west side of the road the same beds are repeated by a great fault that runs from a point 6 miles south-west of Chester through Bala Lake to Cardigan Bay. It has been traced for 65 miles. Where crossed by one of the sections it is a down-throw of about 12,500 feet on the north-west, the trap of Aran Mowddwy being thrown down against the base of the Lingula beds. The Bala limestone was shown to be 6,000 feet above the Aran traps; and 8,000 feet above that, the Caradoc sandstone, which is 5,000 feet thick, appears. The igneous series of the Arans is continuous as far as Moel-wyn, where it is succeeded by the Bala beds, in which series, 6,000 feet above the Moel-wyn traps, a second volcanic set of ashes and porphyries appears. These constitute the Snowdonian series, and some of its beds are the equivalents of the Bala limestone, a fact proved both by measurement and fossils. The igneous rocks of Snowdon have heretofore been considered as the equivalents of those of the lower series. They are at least 6,000 feet higher. The lower set closed the Lingula flag period, the upper set are in the middle of the Bala beds. The intrusive bosses of Caernarvon, Lleyn, and Anglesea were then shown to be of older Silurian date, and the deep seated melted nuclei from whence the contemporaneous volcanic rocks proceeded. Also the metamorphism and foliation of some of the rocks of Caernarvonshire and Anglesea took place in Lower Silurian times. The Cambrian rocks of the Longmynd were then shown to be 26,000 feet thick, and conformably overlaid by 14,000 feet of Llandeilo flags, giving 40,000 feet in all. They are not much altered. Their base is cut off by a fault. This district formed a bold island in the midst of the Wenlock sea, and being gradually encased in Wenlock shale; and a set of beds that successively formed the margin of the Wenlock shale sea at different levels were sandy and pebbly beaches of the Wenlock period, although their fossils have a Carradoc aspect. Lastly, some of the lowest conglomerates of the Cambrian strata of Llanberis were shown to have been formed of the waste of an old land, now entirely lost, containing rocks similar to those of North Wales as it now stands.

Royal Geographical Society, April 11.

A paper on "Oceanic Currents, and their influence on the Central American Canal," by Alex. G. Findlay, Esq., F.R.G.S., *was read.* After a brief reference to the progress of the subject of currents from its origin, by Major Rennell, in 1778, to the publication of his "Investigation," published in 1832, the author proceeded to point out some deficiencies in the system as then established, and showed that the waters of the Atlantic circulated around a space having the parallel of 30° N. as its axis; that a portion of the Gulf-stream flows to the N.E., and ameliorates the climate of the British islands and Norway, without which influence they would be assimilated to Labrador and Greenland. The peculiarities of the Gulf-stream recently elicited were described; a nearly perpendicular wall of warm water in juxta-position with the cold Arctic waters flowing southward, between it and the coast of the United States, and another and parallel branch to the S.E. of it was noticed. The somewhat similar arrangement in the South Atlantic was alluded to, of a current revolution around the parallel of 30° S. The anomalous character of the Guinea current was cleared up by an analogous current in the Pacific, not hitherto noticed. This portion of the subject was illustrated by a large diagram, in which the currents and their polar or tropical origin were very clearly marked. In describing the currents of the Pacific, the subject was a new one, and, at least, two currents of very great magnitude had not yet been noticed, or only indirectly hinted at. A very large engraved chart contained the data. It was shown that the waters from the antartic pole flowed slowly northward and eastward, towards the lat. of 28° N.; that a portion of these cold waters struck the west coast of South America, or about the parallel of 40° S., and dividing, one branch flowed south and east, forming the eastern Cape Horn current; and the other ascending the coast, as a remarkably cold stream, was called the Peruvian or Humboldt's current; reaching to near the American isthmus, it turned past the Galapagos islands, where many singular effects were produced, but that at times a portion continued northward and flowed on to Panama. The Peruvian current flows on westward, and forms the initial course of the great southern equatorial current, between 40° N. and 26° S., which passing the Pacific archipelagoes, has many anomalies, but a portion striking the coast of Australia has a precise relation to the Brazil current in the South Atlantic, and circulates around the space between Australia and New Zealand. The North Equatorial Current is not well defined at its eastern end, but flows strongly towards the Philippine Islands, across the ocean between 10° and 24° N. lat., whence it turns northward towards the coast of Japan. It then forms the impetus to a current not found on

physical charts, and which was here named the Japanese Current, from its analogous relation to Florida and the Atlantic Gulf Stream. This Gulf Stream of the Pacific was then traced by direct observation and inference, from numerous authorities who were quoted, across the entire breadth of the Pacific, to the N.W. coast of America. Its effect on the climate of Sitka and Prince William's Sound were shown to be similar to that on the coast of Norway. The temperature and the wrecks of Japanese junks, the drift of timber to the Sandwich Islands, &c., proved the circulation of the waters around the lat. of 30°, to be the same as in the other thermal systems described. The ocean waters flow southward, down the American coast toward the Bay of Panama or the Great Bight, formed by the American Isthmus; and the new and very important current was then described, and the numerous authorities on which it might be established were quoted. It is a zone of *easterly* drift, between lat. 50° and 60° N., extending all across the Pacific, from the Pellew Islands, nearly to the Bay of Panama, and was named the Equinoctial Counter Current. This singular current has an exact relationship to the Guinea Current, on the opposite side. The origin of this was supposed to be due to the action of the N. N. E. and S. E. trade winds, forcing the waters up to these latitudes, cause them to reverse their normal action; and thus the waters appear all to flow toward that one point, of such great interest at the present time. The navigation about Panama was shown to be very critical and difficult. Respecting the question of the level of the two oceans, if it were not for the counter current it might be reasonably supposed that the Atlantic would be several feet higher than the Pacific, from the waters in each ocean being drifted to their western sides, but which are thus almost exactly balanced. After some complimentary remarks from the President, the meeting was adjourned.

On Ericsson's Hot Air, or Caloric Engine; by William A. Norton, Professor of Civil Engineering in Yale College.*

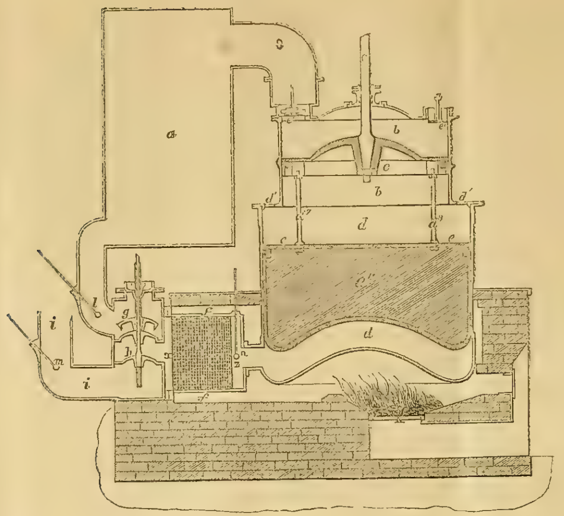
The engines of the Caloric Ship Ericsson consist of four large double cylinders, "standing in a fore-and-aft line; two before and two abaft the shaft of the paddle wheels, and working in pairs upon it." Each cylinder is double, the two cylinders being placed one above the other. The lower one, which is the larger of the two, is called the working cylinder, and the other the supply cylinder. The working cylinder is entirely open at the top, and the supply cylinder at the bottom. The pistons which play in the two cylinders are connected by eight strong iron columns, and move up and down together; the length of the stroke is therefore, of necessity, the same for each, viz: 6 feet. For the sake of distinction, the piston in the working cylinder is called the working piston, and the piston in the supply cylinder the supply piston. Underneath each working cylinder is a furnace, which heats the air in this cylinder beneath the piston, and by thus increasing its expansive force, furnishes the motive power of the engine. The expansive force of this heated air drives the working piston up, and with it the supply piston. During the ascent the air above the supply piston which is compressed before it passes through a communicating pipe into the working cylinder, and receiving an accession of heat keeps up the ascensional force. When the pistons have reached their highest point, a valve is opened by the machine, which establishes a free communication between the compressed and heated air under the working piston and the external air; it flows out, and the two connected pistons descend by their own weight. It is to be observed, however, that the mechanical effect of this descending weight is but a compensation for the diminution of mechanical effect produced by the same weight in the ascent, and that the weight of the pistons therefore forms no part of the real motive power of the engine.

*Sill. Jour.

Confining our attention to the pair of double cylinders posited on either side of the main shaft, in the vacant space between the working and supply cylinders is placed a horizontal working beam, turning upon a shaft lying between the two double cylinders. One of the supply pistons is connected with one end of this working beam and the other with the other end; by means of links and connecting rods: and so, by the alternate action of the two working pistons, a reciprocating movement is communicated to the working beam. It will be seen therefore, that *one double cylinder*, with the necessary appurtenances, *constitutes a single acting engine*, and that *each contiguous pair of double cylinders*, standing on either side of the main shaft, by the connection of their pistons with the opposite ends of a working beam, *form a double acting engine;* that they accomplish the same end as one double acting steam engine.

The shaft of the paddle wheels of the Ericsson is, accordingly driven by two double acting engines; one before and the other abaft the shaft. Each of these engines has its separate working beam. The power is transferred from each of these working beams to the shaft, (which, it is to be observed, is considerably elevated,) by means of a connecting rod passing from the nearer end to the crank of the paddle-shaft. The two connecting rods are attached to the same crank-pin; and the relative position of the shaft and working beams is such that each of the connecting rods has a mean deviation of about 45° from the vertical position, and when one rod is passing the dead centre the other is acting upon the shaft with the maximum leverage.

From what has been stated, it will be seen that in studying the essential theory of the new engine, we may confine our attention to one of the double cylinders with its accompanying mechanical arrangements, which taken together form one single acting engine. The essential parts of this engine are shown in the annexed diagram, which is a copy of Ericsson's representation of the stationary engine. These are, respectively, the double cylinder, with the pistons and piston rods; the furnace, a large vessel communicating by pipes with the top of the supply cylinder and the bottom of the working cylinder, called the *Receiver*; and a piece of apparatus placed in the lowermost of these pipes, called the *Regenerator*. The working piston in the engines of the Ericsson, has a diameter of 14 feet, and the supply piston a diameter of 11 feet 5 inches. The ratio of the areas of these pistons, and therefore also the ratio of the volumes of the two cylinders is as 3 to 2. The working piston is six feet deep, and concave underneath to fit the cylinder-bottom. The top and bottom, as well as the sides, are of iron, but the space between them is filled with gypsum and charcoal, non-conductors of heat. The packing of the piston is at the top. The working cylinder is of necessity prolonged six feet below the position of the top of the piston when at its lowest point, thus forming a large vessel called the heater, or heating chamber, into which the air passes from the receiver. By this arrangement the packing at the top of the piston never comes into contact with any portion of the cylinder that is touched by the hot air. The grate of the furnace is five feet below the apex of the dome-shaped cylinder-bottom. Anthracite coal is used, and acts by radiant heat alone. The supply cylinder is merely a great condensing air-pump, which forces fresh air into the receiver, to be thence transmitted to the heating chamber under the working piston. The supply piston is furnished with thirty-six self-acting valves, which open upwards and through which the air is admitted into the cylinder, in the descending stroke of the piston. During the ascending stroke these valves remain closed, and the compressed air opens another set of valves at the top of the cylinder, and flows along the connecting pipe into the receiver. These two set of valves may be called respectively, the *outlet* and the *inlet* vales. The valve arrangement represented in the diagram is a little different; both



the outlet and inlet valves are at the top of the cylinder. e' is an inlet, and e'' an outlet valve. The air receivers of the four double cylinders communicate with each other by connecting pipes, and thus form, in connection with the several communicating pipes, one common receiver, of so large a size, that as it is asserted, the the elastic force of the compressed air remains very nearly the same in the working of the engine. The receiver is provided with a guage. The communications between the receiver and the heater, and between the heater and the external air are closed by two puppet-valves. These valves are shown in the diagram at g and h. The one I will call the *upper* and the other the *lower* valve. The thermometers at l, m, n, serve to indicate the temperature of the entering and escaping air. When the working piston reaches its lowest point, that is, is nearly in contact with the cylinder bottom, the upper valve is opened by the machine, the compressed air rushes from the receiver through the regenerator into the space underneath the working piston, and the piston is forced up. At two-thirds of the stroke this valve is closed and the heated air acts expansively to the end of the stroke. The lower valve is now opened, and the same body of air escapes through it into the vertical pipe i, which communicates with the external air; passing again through the regenerator on its exit.

The Regenerator is an admirable contrivance of Captain Ericsson's for abstracting the heat, or the greater portion of it, from the escaping air, and restoring it again to an equal body of air entering the cylinder, to repeat the work performed by the air which has just escaped; that is, for employing the same amount of heat over and over again. The regenerator consists of a large number of disks of wire-netting, placed side by side and in a vertical position, in a marginal frame by which they are held very nearly in contact with each other, (see the diagram) Each disk is six feet high and four feet broad, the wire of which it is made is $\frac{1}{16}$th of an inch in diamter, and there are tens of thousands of minute meshes in the whole extent of the disk. The number of meshes in all the disks, added to the equal number of interstitial spaces between the disks, make up, it stated, over 20 millions of minute cells through which the air passes and repasses, on its way to and from the working cylinder. In this way it is brought into contact with several thousand square feet of metallic surface, and parts with or imbibes heat almost instantaneously. It is stated that Captain Ericsson estimates the time occupied by a particular particle of air in traversing the regenerator at about $\frac{1}{50}$th of a second, and that this small interval of time suffices for the transfer of some 400° of heat from the escaping air to the wire, or from the wire to the entering cold air. The clear opening for the passage of the air through the regenerator is about twelve square feet.

We are told that the escape or waste air deposits all its heat, with the exception of about 30°, in the regenerator, the thermometer at m never standing more than 30° higher than that at l. Ericsson estimates that in the case of the stationary engine the amount of fuel wasted in process of transfer, was only *two ounces* of coal per hour per horse-power, while the amount wasted by the radiation of the heated parts was about nine ounces per hour per horse-power, and the entire consumption about 11 ounces. But it should be observed that his calculation involves the supposition that the estimated horse-power (60) was realized in the actual working of the engine. We shall be better able to judge of the probability of this, after we have considered the details of the performance of the engines of the Ericsson.

After the engine has got into full operation, and the regenerator has reached its normal condition, there is a great difference between the temperatures of the inner and outer surfaces of the regenerator. We are told that in the case of the regenerator of the stationary engines this difference was never less than 350°. The explanation is found in the fact that the heated air on its escape through the regenerator, must undergo a continual diminution of temperature, as it parts with its heat to the successive wire-netting, and on the other hand the entering cold air, on passing through the successive disks, which are of a higher and higher temperature, will tend to lower the temperature of each one of these disks, and at the same time to increase the difference of the temperature between the outer and inner surfaces of the regenerator, and thus to compensate for the tendency to equilibrium of temperature produced by the flow of heat from the inner towards the cooler outer surface. For, while it will reduce the temperature of the outer surface, if the regenerator has sufficient thickness, nearly to an equality with the temperature

of the external air, the inner surface being exposed towards a highly heated enclosure will be less affected. It is to be observed that the temperature of the external surface of the regenerator cannot at any time be greater than that of the air escaping through the pipe *i*, and that the temperature of the internal surface can never be less than that of the air issuing from this surface, on its passage into the working cylinder, or rather, heating chamber.

The preparation necessary for starting the engine consists in "keeping up a slow fire in the furnaces, for about two hours, until the various parts contained within the brick work shall have become moderately heated, and then charging the receiver with air by means of a hand-pump," until the gauge shows a pressure of about 8 pounds above that of the external air. The upper valve, *g*, is then opened by a starting bar, and the compressed air flows into the working cylinder, and begins the work of raising the piston.

We are now prepared to enquire into the

THEORY OF THE MOTIVE POWER OF THE ENGINE.

I will first state a few principals which it is important should be kept in view.

1. The expansive force of the heated air under the working piston must be somewhat less than that of the compressed air in the receiver; otherwise the air in the receiver would have no tendency to flow from it into the heating chamber. The difference may not amount to more than a few ounces; it depends upon the obstructions to the free flow of the air and the relative size of the aperture of communication and heating chamber.

When the air is flowing from the supply cylinder into the receiver, its elastic force must exceed that of the air in the receiver; for the additional reason, beside that just stated, that the vales in the supply piston would close if no such difference of pressure existed.

In seeking to determine the power of the engine, I shall however disregard the inequality of pressure and suppose the expansive force of the air to be the same in the working and supply cylinders as in the receiver, so long as the communications between them are open.

3. Since the two connected pistons are of unequal size, and the elastic force of the air pressing upon them the same or nearly the same, the entire upward pressure exceeds the downward pressure, and the two pistons are urged up with a force equal to the difference of these pressures. This statement is here made with respect to the actual pressures subsisting when the communications are open. We shall see hereafter that it might also be made in regard to the mean effective pressures throughout the stroke.

4. In the engines of the Ericsson the cut off is introduced at the $\frac{2}{3}$ stroke, and therefore the space underneath the working piston into which the air is admitted from the receiver, before the cut off valve is closed, is equal in volume to the interior of the supply cylinder. It will soon be seen that this is in accordance with a general principle, the adoption of which is essential to the most efficient operation of the present form of engine.

5. When the engine has reached its permanent working state, the quantity of air admitted into the working cylinder, each upward stroke of the piston, cannot exceed the quantity forced into the receiver, from the supply cylinder, during the same interval. In fact it must be less, by reason of the waste from *leakage* and *clearance.*

Now it will be perceived that if this quantity of air, after being admitted into the working cylinder, as just supposed, retained the same temperature, its elastic force would be the same as that of the external air (15 lbs. say, per square inch) since the same quantity originally filled the supply cylinder, at this pressure. But if we suppose the temperature to be elevated 480°, or thereabouts, by the heat derived from the regenerator and the heating chamber, its elastic force would be doubled, or amount to 30 lbs., per square inch. To realize this supposition the compressed air in the receiver must therefore have an expansive force of over 30 lbs., or 15 lbs., above the atmospheric pressure. If the working temperature in the lower cylinder were 384° above the temperature of the external air instead of 480°, then the pressure in that cylinder, and of necessity therefore in the receiver, would be 12 lbs., above the atmospheric pressure, (i. e. $\frac{384}{480}$ths of 15 lbs.) It will be seen then that the working pressure in the receiver and the working temperature in the principal cylinder are necessarily connected together—that the one determines the other.

It is here supposed that there is no leakage or clearance, but the fact is otherwise; and therefore the quantity of air admitted into the working cylinder, each ascending stroke, is less than that which is expelled from the supply cylinder into the receiver. If we suppose the pressure in the receiver to be 8 lbs., above the atmospheric pressure, and that the leakage and clearance, at this pressure amounts to $\frac{1}{4}$, then $\frac{3}{4}$ of the air furnished by the supply cylinder will enter the working cylinder, and its elastic force, for the $\frac{2}{3}$ stroke would be reduced to $11\frac{1}{4}$lbs. ($\frac{3}{4}$ of 15 lbs.,) by the expansion, if the temperature remained unchanged, but the 480° of additional heat will augment this to $22\frac{1}{2}$ lbs., or 15lbs., + $7\frac{1}{2}$ lbs. Now 8 lbs. above the atmospheric, is the actual working pressure of the engines, we may conclude therefore, that if the working temperature is 480° above the atmospheric temperature or a little less, the waste from leakage and clearance, during the double stroke, must amount to nearly $\frac{1}{4}$. The actual working temperature is undoubtedly less than this, but how much I have not been able to ascertain with certainty. The actual leakage is therefore less than $\frac{1}{4}$, but its exact amount cannot at present be determined. According to the newspaper accounts the working temperature, on the trial trip, was about 450°, or 418° above the temperature of the air (taken at 32°.) This would make the waste, from leakage and clearance, about $\frac{1}{5}$. It undoubtedly lies between $\frac{1}{4}$ and $\frac{1}{5}$.

Working at a given temperature, and with a given cut off, the leakage will determine the working pressure. To show this suppose the elevation of temperature to be 480°, and the leakage $\frac{1}{4}$ at a pressure of 8 lbs., shown by the receiver-guage; then at 12 lbs. pressure the leakage, if we disregard the clearance which is comparatively small, would be $\frac{3}{8}$ths, and the elastic force of the air in the working cylinder would be reduced from $7\frac{1}{2}$ lbs. to $3\frac{3}{4}$ lbs. If the communications remained the same, so great a difference of pressure between the receiver and the cylinder could not be realized; an additional quantity of air would flow out of the receiver, and this would go on for each successive stroke until the pressure in the receiver was reduced to 8 lbs. or thereabouts, when the pressure in the cylinder would be $7\frac{1}{2}$ lbs., and the engine would be nearly in its permanent working condition.

From this cause, (viz., the leakage,) mainly, as it would seem, the expected pressure of 12 lbs. has not been obtained in the working of the engines of the Ericsson. This is in fact the reason assigned by the builders of the engines, for the fact that no higher pressure than 8 lbs. has yet been realized.

There is another mode of presenting the theory of the motive power of the caloric engine. Suppose that the constant pressure in the receiver is 15 lbs. + 15 lbs. On this supposition air will begin to pass from the supply cylinder into the receiver, at the end of the $\frac{1}{2}$ stroke, or thereabouts, and will continue to flow to the end of the stroke, at a pressure a little above this. At the end of the $\frac{1}{2}$ stroke of the supply piston the body of air which

originally filled the supply cylinder at 15 lbs. pressure, will occupy one-half the space at 30 lbs. pressure. Now, while the communication between the receiver and the working cylinder continues open, that is during the $\frac{2}{3}$ stroke, if we disregard the leakage, &c., the same quantity of air, at the same pressure of 30 lbs. will flow from the former to the latter. It is capable of filling a space equal to one-half of the supply cylinder, or what amounts to the same, one-third of the working cylinder, at the same temperature, without any change of pressure; therefore in expanding to fill two-thirds of the working cylinder, its expansive force will be reduced to 15 lbs. To compensate for this it is only necessary that its temperature, as fast as it flows in, should be elevated 480°, when its expansive force will be retained at 30 lbs.

A similar explanation may be given for any other supposed pressure and temperature, and the question of the leakage may be considered from this point of view.

It has been stated that the cut off, whatever may be the relative size of the two working cylinders, should be so adjusted that the portion of the working cylinder into which the air is admitted while the valves remain open, will be equal in volume to the whole supply cylinder. To show this, we will at first leave the leakage out of view, and denote the fractional part of the stroke answering to the cut off supposed, (in the present engines $\frac{2}{3}$) by a, and a larger fraction of the stroke, answering to a different cut off, by b. Let b be n times greater than a. Now, if we conceive the fractional cut-off stroke to less than a, the actual working pressure remaining the same, the mean effective pressure for the whole stroke, will be less than when a is used. If, on the other hand, it be made greater, (as $b=na$,) the body of the air which originally filled, the supply cylinder at 15 lbs. pressure and 32° emperature, on entering the working cylinder will expand n times, and its working force will be $\frac{15}{n}\times 2$ (supposing working temperature to be 480°+32°;) whereas, for to cut off a the force will be 15×2, and in the subsequent expansion from a to b, the mean force throughout the fractional stoke b will be greater than $\frac{15\times 2}{n}$, since this will be the actual force after the expansion to b.

The same will be true if we take the leakage into account; for suppose the leakage to reduce the pressure of the air that fills a, before it is heated, to $\frac{15}{m}$, then when heated 480° the pressure becomes $\frac{15}{m}\times 2$, which we will put equal to k. Now, if we suppose, as before, the cut off to be increased from a to b, the force k will be reduced to $\frac{k}{n}$; but the mean effective pressure for the same fractional stroke b, when the cut off a is used, will be greater than this, and the actual pressure after the expansion to b, will be $\frac{k}{n}$. So that the constant pressure for the b cut off is equal to the pressure for the a cut off reduced by the expansion to b.

It may be well to inquire, in this connection, into the proper relative size to be given to the supply and working cylinders to obtain the greatest amount of motive power from the engine. Let A=area of supply piston, and x=ratio of working to supply piston; then, by what we have seen, the portion of the stroke during which the air is flowing into the working cylinder, and acting with its full constant pressure is equal to $\frac{1}{x}$. Calling this pressure per square inch, P, the following proportion gives us the mean effective pressure (p) on working piston for the whole stroke, viz., $x : \text{hyp. log. } x+1 : : P : p = \frac{P \log. x + P}{x}$. The mean effective upward pressure upon the whole piston will therefore be expressed by $\frac{P \log. x + P}{x} \times Ax$, or $P.A \log. x + P.A$. The downward pressure on the working piston=15lbs.$\times Ax$, and hence the resulting effective pressure$=P.A \log. x + P.A - 15Ax$. With the aid of the differential calculus, we find this expression to be a maximum when $x=\frac{P}{15}\left(\text{more accurately } \frac{P}{14.7}\right)$; from which it appears that the engines will have the greatest possible power, at any given working pressure, when the cut off, taken inversely, and the ratio of the volumes of the two cylinders, are each equal to the working pressure per square inch, divided by the atmospheric pressure (15 lbs). Accordingly the ratio of the bulks of the cylinders ought to vary with the working pressure used. When this pressure is 8 lbs. above the pressure of the atmosphere the cubical content of the supply cylinder ought to be $\frac{648}{1000}$ of that of the working cylinder, and the portion of the stroke from the commencement at which the air is cut off, the same. The actual ratio of the cubical contents of the cylinders of the engines of the Ericsson is $\frac{665}{1000}$, ($\frac{65}{100}$ nearly), and the fraction of the stroke at which the air is cut off is said to be about $\frac{63}{100}$.

If a pressure of 12 lbs. instead of 8 lbs. were used, the same ratio ought to be $\frac{55}{100}$. This would make the radius of the working piston 15·4 feet. It was Ericsson's original design that it should be 16 feet.

Let us see now how the *power of the engines* of the caloric ship is to be determined. The actual pressures upon the two pistons are the same, or nearly the same, while the communications are open; the pressure on the top of the supply piston begins at 15 lbs., becomes 8 lbs. + 15 lbs. at the $\frac{3}{4}$ stroke from the end (more accurately $\frac{65}{100}$), and continues the same to the end of the stroke. The air is shut off from the working cylinder at the same fractional part of the stroke, and acts expansively to the end of the stroke. The mean effective pressure per square inch, for the whole stroke, is then the same upon both pistons. It may be found in the usual manner, by the use of hyperbolic logarithms. Multiply this, diminished by 15 lbs., into the difference between the areas of the two pistons, expressed in square inches, and again into the velocity of the piston per minute, and divide the product by 33,000, and the result will be the *horse-power* of one of the engines.

But it is to be observed that the result thus obtained will be somewhat too large, for the following reasons. 1. The actual pressure in the supply cylinder is greater than the pressure in the receiver (8 lbs.), and the actual pressure in the working cylinder is less than this. 2. During the $\frac{1}{3}$ stroke from the commencement, the outlet valves at the top of the supply cylinder remain closed, and consequently the expansive force of the air in the receiver must be somewhat reduced by the flow of air from it into the working cylinder. 3. After the cut off valve is closed, the elastic pressure of the air in the working cylinder during the remaining $\frac{1}{3}$ stroke, must be diminished somewhat by leakage. The effect of this leakage has not hitherto been taken into account.

To be Continued.

The Dublin Great Industrial Exhibition.

The Inauguration of Ireland's first Great Exhibition of the productions of her own and other nations, took place at the appointed time,—and passed off with brilliant success. The weather was most propitious, and the assemblage brilliant. The central hall—upwards of 400 feet long, as we have said—was left clear for the company, which filled from end to end. There must have been at least 15,000 people present; including the Lord Lieutenant, the representatives of the Church, the Bench, the Bar, the University, the Army, and the Corporations and Guilds of Ireland,—besides a large number of visitors from England, Scotland, and other countries. The hall was hung with upwards of 150 heraldic banners:—which added much to the picturesque appearance of the whole.

The music was in itself a great triumph. It was of a high character and performed with marvellous accuracy; and the effect of the 800 performers, vocal and instrumental, aided by the great organ, was sufficiently powerful to fill the building, without being marred by that superabundance of noise which often spoils the effect of the finest compositions and execution.

The exhibition itself, it must be confessed, was somewhat hidden by the ceremony which was to usher it to the world—the means overlaid the end. The object of the exhibition is, the practical and useful:—that of the inauguration was, the introduction to high society, with a view to give it that stamp which recommends both men and things so forcibly to the public. It is to be hoped that some day the Useful and Beautiful may walk hand in hand, independantly, through the world,—that an order of merit will rank side by side with orders of nobility:—but those who have the management of Industrial Exhibitions or of any other great public displays must take the world as they find it at present, and use the means which are common to all.

The main body of the Exhibition was far from complete on the opening day,—but the managers had wisely prepared a great treat for their visitors in the Picture Gallery. The collection is perhaps the finest that has ever been seen of the works of modern and especially of living artists. The room is 325 feet long by 40 broad, and already contains nearly 600 pictures. Many more have yet to be hung; and an additional gallery, about a quarter the size of the present, is in preparation for the remainder. The Belgian and English shcools are most fully represented; next to these, the German; then, the Dutch; and lastly the French. The foreign collections were made by Mr. Roney, the Secretary, with the assistance of the Emperor of the French, the King of Prussia, and Dr. Waagen, the King of the Belgians, and the Dutch Government. The English pictures have been contributed by private individuals,—including Her Majesty and Prince Albert; and several of the finest productions of the English school have thus been brought before the public for the first time for many years, amongst which may be mentioned Hogarth's 'Gates of Calais' and 'Last Stake'—Landseer's 'Bolton Abbey'—Wilkie's 'Rent Day'—Borker's 'Woodman'—Danby's 'Deluge' Mulready's 'Wolf and Lamb'—Etty's 'Rape of Proserpine.' A late number of water colour drawings and prints are placed on screens in this gallery,—and the centre is occupied by sculpture. The most remarkable of this last, perhaps, is the 'Boy and Dolphin' attributed to Raffælle, The sculptors of Ireland make an excellent show. This division of the Exhibition must alone draw a very large number of visitors, for such a collection of works of Art is not likely soon again to be brought together.

One end of the Fine-Art Gallery is devoted to mediæval exhibition; which is in process of being arranged by Mr. Hardman of Birmingham, and will include painted glass, iron, brass, and silver work, ecclesiastical fittings and vestments, wood carving, ornamented tiles, &c. The ceiling is covered with ecclesiastical emblems. The department is considerably larger than that in Hyde Park, and will be much more complete in design and arrangement. The contents of this department, whatever may be its faults and peculiarities, may teach the people of Ireland an important lesson upon Ornamental Art. The value of the articles is very considerable; but that value resides not in the costliness of the materials, but in the artistic labour which has been expended on them. The Irish have a fertile fancy and great aptitude; and this portion of the Exhibition may dispose them to produce articles of ornament, as the Art-workmen of the middle ages did, by the application of taste and skill to materials of comparatively little worth,—and to avoid imitating our heavy, costly, and often inelegant, pieces of plate.

A glass case in the Picture Gallery containts a collection of memorials of Edmund Kean:—including a sword and box presented to the Tragedian by Lord Byron, and another sword given to him by the people of Edinburgh, with the play-bills of his first and last performance in London,—the characters and dates being, Shylock in 1814, and Othello in 1833. In addition to these, there are, a dagger which belonged to Henry the Eighth and the hat of Cardinal Wolsey, from the Strawberry Hill collection.

There will be a fine collection of East Indian and Chinese articles—contributed by Her Majesty, the East India Company, the United States Service Museum, the Royal Asiatic Society, the Society of Arts, and several private individuals. The standards taken in China and the guns captured at Sabraon and Goojerat by Lord Gough, attract much attention.

The most important sections of the collection to Ireland, however, are those which are self-derived, and which represent her natural resources or the industry of her people. One of these is, a collection of Irish Marbles—not merely cabinet specimens, but good practical examples—exhibited by the Royal Dublin Society, in whose grounds the Exhibition building, as our readers will remember, stands. The Exhibition, in fact, although entirely independent of the Society, has taken the place of the triennial exhibition which that body had held regularly since 1821. Its last exhibition, that of 1850, was indeed thrown open to all the world; but no trouble was taken to obtain contributions from abroad; and the space would not have permitted many foreign articles to have been introduced. On the 24th of June last, Mr. Dargan made the liberal offer to put down £20,000 for a grand Exhibition on condition that the Society would permit the building to be erected on their lawn. This was readily agreed to. Mr. Dargan's expenditure has grown to nearly £100,000; and the building has increased in the same ratio, until it has covered not only the lawn and gardens, but also the court in front of the Society's house, which it completely surrounds. The Marbles exhibited by the Royal Society form part of a much larger collection which it is now making, and for which a new museum is to be erected. For this purpose the Society have set aside upwards of £2,000,—subscriptions have been made to the extent of £800,—and Government has promised a grant of £5,000. The object in view is very important to Ireland. At present, for want of the necessary stimulus, the working and conveyance of the native marbles are both costly.—but there is no intrinsic cause why they should remain so. The Society intend to furnish their entrance hall with architectural fittings worked in Irish marbles. A door-case in fine red marble, two large tables in green Connemara, and a fount in black marble, are included in the collection now shown. There can be no doubt of the value of such efforts as these. The native marbles of Ireland are very beautiful,—some of them quite unique; and if the Exhibition draws attention to them, and leads to improvements and greate

economy in working them; it will render a very important service.

The Royal Irish Academy of Science will show a very interesting collection of Irish Antiquities comprised in its Museum,—along with contributions for the purpose from the Board of Works, and from several private individuals. The collection of the Academy is very curious and important: including many rare ecclesiological antiquities, and a large number of implements, tools, and arms, illustrative of the early Art of the country. The Banner of the O'Donnell family—the Psalms of St. Columb—and some other specimens—are very celebrated in Irish history. The Museum of the Society is liberally opened to all applicants, and the specimens are admirably arranged. To the present time, however, the institution has been without a Catalogue,—which will now be supplied by the Great Exhibition, and which will doubtless, soon give rise to a great extension of the Museum. Included in the Academy's Museum is a collection of Danish and Norwegian antiquities, presented by the King of Denmark and the Directors of the Museum of Copenhagen.

The Irish Fisheries Commissioners contribute a large collection of apparatus and tackle used in the fisheries; including not only those at present employed, but also specimens of those which have been superseded or improved,—together with models of what are called River fixtures, and other means of capturing the finny tribe.

In one of the galleries is a collection of 257 specimens of the Birds of Ireland, indigenous and immigratory, together with their eggs. These belong to a private gentleman of Dublin, named Waters, and are very well arranged in scientific order.

There is a very curious collection of work, principally of the coarser descriptions, exhibited by the guardians of the twenty-seven Poor Law Unions.

The general departments of the exhibition in which Ireland makes the greatest show are :—linen manufactures—poplins, including a loom for making a new brocaded variety, which will as we have said, be woven in the building—Balbriggan hosiery, —saddlery and leather work—church bells, of which there are some large and fine specimens—carriages—engineering and architectural designs—musical instruments—lace, embroidery and needle-work of every description, and most of it in good taste —clothing—furniture—agricultural machines and implements—and food, which, after the example of Hyde Park Exhibition, includes tobacco and snuff, in wholesale quantities. There are also several samples of beet-root sugar—bacon and hams in endless profusion—and no small supply of whisky. In this latter case the committee have not followed the lead of London;—nor have they done so in the refreshment-rooms, where malt liquors of all sorts are freely dispensed, and where probably whisky is not a stranger.

Since the opening day the work of arrangement has proceeded with rapidity,—and the effect produced has been marvellous. There were some indications of flagging previous to the inauguration; but it seems to have disappeared under the influence of the excitement of that day,—and to have been replaced by confidence and natural feeling of satisfaction at which has been already achieved, and what promises to be accomplished.

In another week the greater part of the Exhibition will be complete. It will, indeed, it already does, reflect the highest honour upon the Irish people. In the history of our country there is not recorded a more important or more praiseworthy act than the raising of this temple of industry; and the effort which has been made under so many difficulties, *must* yield a substantial and enduring reward.—*Athenæum.*

INCORPORATED BY ROYAL CHARTER.

Canadian Institute.

Council Meeting, June 11th, 1853.

DONATIONS.

1. The Corresponding Secretary announced the presentation to the Institute by Mr. Bohn, the eminent London Publisher, of six volumes of Bohn's Scientific Library.

2. The presentation was also announced of two pair of Stagshorns of very extraordinary dimensions, by Mr. Maurice S. Baldwin, Junior Member of the Institute.

The names of the following Candidates for Membership were laid before the Council on the evening of June 4th :—

S. W. Hallum, Junior Member..........	Toronto.
T. C. Gregory,........................	Windsor, C. W.
Rev. R. Whitwell,....................	Phillipsburgh.
J. E. Pell,...........................	Toronto.
Rev. B. Cronyn,......................	London.
C. McGregor, Junior Member..........	Toronto.
E. M. Crombie, Junior Member,........	"

It was ordered that the Secretary should be directed to communicate to the above named gentlemen that the formalities of their election could not be completed until the first General Meeting in December, but that on payment of the Subscription for the current year they will be entitled to a copy of the Journal from January last, and to the use of the Reading-room.

Provincial Observatory; Toronto.

In the February number of the Canadian Journal we published the Memorial of the Institute to the three branches of the Legislature to continue the Royal Magnetic Observatory, under Provincial management. The reply of the Provincial Secretary on the part of His Excellency the Governor General, contained the following passage:—"I am directed by his Excellency to acquaint you, (Capt. Lefroy) and through you the members of the Canadian Institute, that the subject referred to in their me-

morial has, for some time past, engaged his Excellency's most anxious consideration, and that his Excellency has already taken the necessary measures to prevent, if possible, the proposed dismantling of the Observatory, by the Imperial authorities, at the end of next month." [See March No. Can. Jour.]

It is now our pleasing duty to announce that the very liberal sum of two thousands pounds has been voted by the Provincial Parliament for the reorganization and temporary maintenance of the Scientific Observatory at Toronto.

The prominent part taken by his Excellency the Governor General in securing the maintenance of an Observatory, which has already won for itself an American and European fame under the admirable management of its late accomplished Director, will secure a grateful acknowledgment from all interested in the progress of scientific enquiries in this Province. We shall return to this subject in the next number of the Journal.

Gold in Canada.

The extraordinary discoveries of Gold in California and Australia during the last four years, have so absorbed the attention of the public, that announcements, however important and advantageous, of the existence of other less dazzling but perhaps far more useful Mineral Deposits, have hitherto failed to excite that amount of public and private enterprize which, during other less Golden periods, would have stimulated to active exertion.

We shall not, probably, greatly err, if we venture to express the opinion that traces of a healthy reäction are now distinctly discernable in the Golden Fever of the day, lately so prevalent among classes in the enjoyment of permanent and remunerative industry.

The excessive toil and continued privation required on the part of the Gold Digger,—not always with adequate results,—coupled with the well-ascertained fact, that those who continue to occupy themselves in the regular routine of established industry, more generally accumulate a sufficiency for independence and comfort, are happily arresting that unquiet spirit of adventure which has been so greatly aroused during late years.

We have elsewhere drawn attention to the admirable letter of Mr. Millett, on the Mineral Wealth of Nova Scotia. Coal, Iron, Copper, Barytes, and exquisite Marbles, constitute a noble Gold Field for our sister Province; and such treasures, with the exception of Coal, exist, too, in Canada East and West, independently of the more dazzling Metal to which we shall now call attention. Let us, however, suppose for a moment that a widely distributed auriferous soil, rivalling in richness the famed fields of Australia, were to be brought to light, and without due preparation and precaution on the part of the Provincial Government, thrown open to the cupidity of those uneducated masses now crowding into the country. What effect would such a discovery have upon the construction of the vast system of Railways in progress or in contemplation throughout the Province? What difficulties would soon arise with our Gold worshipping and not over scrupulous or tractable neighbours! What a sudden and destructive check would the agricultural industry of the country receive, and all other branches dependant upon that expanding source of our present unexampled prosperity! What a flood of vice and crime would rush in to disturb, with its unhallowed and demoralizing influences, the quiet pursuit of intellectual and moral wealth, which now begins to display itself so vigorously amongst us! Here and there, throughout Western Canada, we find a painful solution of the question, in the case of a few misguiding or misguided individuals. Digging for Gold is a positive fact in various parts of Canada West. Delving sixty feet deep through the rich and teeming clays of the Valley of the Thames, and in the black bituminous shales below the veritable Golden Field (of Grain), the discovery of a few glittering lumps of Iron Pyrites is enough, in these days of Golden Fever, to turn men from remunerating Industry to waste their means in the hopeless search for Gold where no Gold exists. If digging for Gold under such unfavourable conditions be sufficient to secure the present ruin of a few, and to produce much local excitement, what might one expect if a rich auriferous soil in a thinly settled district were suddenly revealed to the eager and unfettered grasp of the uneducated labour of the country?

But does Gold really exist in Canada? Is it found in quantity likely to prove remunerative? To both of these questions we think we may answer in the affirmative with certainty. We may also hint to our Western friends, who are anxiously searching their own and their neighbours farms for the precious Metal, that the region which may truly be called Golden lies some hundred miles to the East and North-East of Western Canada. There appears no longer to exist any doubt that Gold is distributed over very considerable areas in Canada East, and in sufficient abundance to cause it to become a source of some anxiety to many interested in the progress of our Public Works and the general Industry of the Provinces.

We write, however, in the firm belief that precautionary measures are in progress, under the sanction of the Provincial Government, which will convert what would otherwise be a lamentable discovery, into a source of real advantage and profit to the country at large.

We have for some time past been aware of the existence of one powerful Association,—embracing some of the most distinguished individuals in the Provinces,—framed for the purpose of working a portion of the recently discovered Gold Fields on the Wage system, abjuring the Leasing system: a system at once ruinous to the labourer and destructive to order and morality.

We entertain and venture to express the opinion that whatever may be the extent of the Gold deposits in Eastern Canada, it is of the utmost importance that all Mining operations should be conducted systematically,—should be under Government supervision,—and that labour should not be dependent upon the success of individual exertions, but be in strict subordination to the Wage system.

REVIEWS.

1. *Report of the Board of Directors of the Ontario, Simcoe, and Huron Railroad Union Company—June 6.*

2. *Report of Alfred Brunnel, Chief Assistant Engineer, Ontario, Simcoe, and Huron Railroad.*

The Report of the Directors of the Ontario, Simcoe and Huron Railroad Union Company read by the Secretary at the annual general meeting of the Shareholders, at the office of the Company on June 6, is without doubt, one of the most feeble and melancholy effusions of the kind which it has ever been our misfortune to peruse. It commences by assigning three singularly unimportant reasons why the Directors "*felt*" it due to themselves and the shareholders that they should report upon the general position of the Company; and with this "*view*" they begin, continue and close their report with a doleful relation of disappointments, misunderstandings, defeats, faint hopes, and indefinite anticipations.

The *first* important difficulty appears to have originated with the Corporation of Toronto, and considering the very grave results due to the resolutions of that body (not explained in the Report) such as placing the Company in a false position—delaying the construction of the road—injuring its financial credit—we are bound to say that the report speaks of the Corporation in a very mild and courteous manner.

"The payments to the contractors have been made from time to time in pursuance with the original and supplemental contracts. so far as the Board have been enabled to carry the same into effect; but they regret that the difficulties which arose in regard to the resolutions of the Corporation of Toronto, granting aid to the Company; and the subsequent requirement for and a surrender of the loan; as also of the gratuity of £25,000, originally voted by the City Corporation, materially impeded the Directors in carrying out their contract with Messrs. M. C. Story & Co., and placed the Company for some time in a false position, delayed the construction of the road, and injured its financial credit. Subsequently, however, these difficulties were surmounted, and the construction of the road has progressed in accordance with the terms of the contracts."

The *second* misunderstanding is also with the Corporation of the City of Toronto, and is thus alluded to in the Report:

"The Company have been unfortunate in regard to their original understanding with the City of Toronto Corporation to construct a terminus on the market block, inasmuch as subsequent experience has shown that the location is not a good one, and that both the City and the Company would be injured by the construction of a city depot there. Acting upon this conviction, and fortified by the advice of their engineers, your Board determined on locating the city terminus on the Bay Shore, between Yonge and Bay Streets, and took the requisite steps under their act of incorporation to ensure the getting of the land and water frontage for that purpose."

The *third* misunderstanding is of a more important character, and is also laid at the door of the unfeeling Corporation of Toronto. It is referred to with affecting simplicity in the following pathetic paragraphs:

"The Directors regret to state, that after expending a considerable sum of money upon works at the last mentioned location, the Corporation of Toronto instituted proceedings in Chancery against the Company, and succeeded,—in consequence of the time limited by the charter to acquire lands having expired,—in *quashing* the orders they had obtained; and the Company are still under an obligation to erect the depot on the objectionable site, and the requisite excavations have been commenced for that purpose. Your Board have always been willing and offered to make an exchange of this site for other lands of the Corporation suitable for depot purposes; but as yet that body have not consented to the proposal made to them. The position of the Company with the Corporation remains, consequently, in an unsatisfactory state."

The style in which the wicked success of the Corporation is introduced deserves a nobler field for the display of its vigour than that offered by a mere railway report. The conclusion arrived at by the very gentle authors of the gem before us we think we may endorse without further enquiry. "The position, says the Report—the *position* of the Company with the Corporation remains consequently in an unsatisfactory state."

The selection of a harbour for the Northern Terminus is next adverted to, and much to our chagrin we find that here as in the other cases we have noticed affairs remain in an unsettled and distracted condition. After all that has been stated, written, published and *sworn* in favor of the Hen and Chickens, after the *positive* evidence frequently brought forward of the fitness and adaptation of the Harbour for all the purposes of the Company, the Northern Terminus of the Railway has been virtually "*quashed*" by the Board of Railway Commissioners just as the Southern Terminus was "*quashed*" by the Corporation of Toronto.

"The selection of a harbour for the Northern Terminus, has been a subject to which your Board have given their particular attention. The Chief Engineer, in his last printed report, reviewed the advantages and disadvantages of the various Harbours, and the line leading to the same, and, keeping in view the desirability of extending your line to the westward, reported in favour of Collingwood.

"The Directors, after mature and anxious consideration, adopted Collingwood Harbour, subject to the approval of the Board of Railway Commissioners; and the matter having subsequently been brought under the notice of the Commissioners, they communicated their opinion and views, in a letter addressed by them, on the 27th of April last, to the President of your Board. The following extract from that letter will explain better than any comment, the result of their consideration upon the question referred to.

"The Board of Railway Commissioners have given their best attention to the subject of the selection of a Northern Terminus, for the line of the Ontario, Simcoe and Huron Railroad.

"So far as the Commissioners have been able to ascertain, four sites have been up to this time proposed for such Terminus, all in the Georgian Bay, which seems to have been originally selected by the Company as the Northern Water Terminus for their Road. Two of these sites are in Gloucester Bay, viz:—Penetanguishene and Victoria Bay. The Commissioners entirely concur with the Engineer in deciding against either of those Termini, being fully convinced that the interests of the public will be best served by giving the Road a Westerly Direction. The other sites which have been brought under their consideration are Nottawasaga and Collingwood, both in Nottawasaga Bay. The Commissioners are of opinion that the objections to Nottawasaga River as a Terminus are insurmountable. The only other site treated of by the Engineer is Collingwood; and although the Commissioners if compelled to decide in favour of some one of the sites brought under their notice, would have no hesitation in giving the preference to Collingwood, yet such strong objections have been made to that place by persons whose opinions are entitled to respect, that they have felt it their duty to consider whether some Terminus less open to objections cannot be found, either within or outside of the Georgian Bay.

"They are of opinion, that if a good Harbour could be obtained outside of that Bay, on Lake Huron, it would be a most desirable change. It seems doubtful whether, under their present charter the Company can extend their line to Lake Huron, if they touch Georgian Bay at Collingwood. However, their financial arrangements have been made with a view to an expenditure much more limited than would be required if the road were carried to Owen's Sound, Saugeen, or Fishing Islands; and the Commissioners could not sanction any new proposition, unless with the distinct understanding that the guarantee of the same is not to be increased. The Company is now endeavouring to obtain permission from the Legislature to extend its Line Westward; and the Board trust that they may be successful. Meantime the Railway Commissioners, in view of the facts that is important to the Company to complete their present contract, and to fix on some terminus on Nottawasaga Bay which may afterwards be used as a way station, are of opinion that further exploration of the Georgian Bay west of Collingwood should be immediately made, with the view of ascertaining whether any other site more desirable than Collingwood can be found, and they recommend that the Directors obtain the assistance of some person of nautical experience in the survey. And with a view of obviating further delay, the Board of Commissioners are prepared to give their assent to the proposition of the Directors, regarding Collingwood, in case no better site can be found after a new exploration, In that case however, they recommend that the expenditure at Collingwood should be on a limited scale for the present, as they are not convinced that such a harbour can be obtained as the public interests require."

"Your Board *considered that the suggestions of the Railway Commissioners*

demanded attention, and have accordingly taken the necessary action to carry their recommendations into effect.

As doubts existed as to the power of the Company to touch at more than one point on Lake Huron, or to extend the Line further Westward than Collingwood ; and, as the litigation with the Corporation of Toronto above referred to, resulted in a judgment of the Court of Chancery, materially impairing, and, in some cases, destroying, the powers which had previously been exercised by the Company, it became necessary to apply without delay to Parliament, for the revival of those powers ; and to obtain a Legislative authority to touch at more than one point on Lake Huron, and to extend the Railroad to the Eastern Shore of that Lake. A Bill has passed both Houses of the Legislature and now awaits the Royal assent, giving the Company the necessary powers, with the right to increase their capital to carry out the extension of your Line. With the view to such an extension, an exploration is now proceeding under the order of your Board.

The report tapers off with an allusion to the financial condition of the Company, and 'hopes,' 'anticipates,' that as the accounts of the Company have hitherto presented a statement of "continuous outgoings," they will next year present a "fair amount of incomings." During the penning of the last half dozen lines, the framers of the report evidently revived a little and found strength and courage to 'hope' and 'anticipate' that the "Proprietors, Directors, Government, and Contractors, may each discover that the spirit which initiated, and the perseverance and energy which is carrying to completion this link of communication and connexion with the Northern Lakes, have not been without beneficial results to the public, the Company, and the advancement and progress of Upper Canada."

It occurs to us that if "Proprietors, Directors, Government and *Contractors ! ! !*" have yet to "discover" the beneficial results of the Northern Railroad they must seek for better guides than lamenting and languid reports, whose feeble repinings will do more to weaken a great and noble work, than all the hard fighting, legal, battle fields through which it has been successfully carried to completion for one half of its length, and in spite of which, it will shortly arrive at the fullness of the measure of its growth.

2. *Report of Alfred Brunel, Chief Assistant Engineer, Ontario, Simcoe and Huron Railroad.*

This is a sensible document, and contrasts strikingly with the wishy-washy 'report' we have just noticed. We give the most interesting portions of Mr. Brunel's communication below. The portions omitted refer to topics already discussed.

To the President and Directors of the Ontario, Simcoe and Huron Railroad Union Company.

Owing to the continued illness and consequent absence of the Chief Engineer, I have the honor to submit the following Report of the progress of the work on your Road, as called for by resolution of the Board, under date 20th ultimo :—

Since the Report made by the Chief Engineer in February last, the works generally have progressed in a satisfactory manner. The first section of the Road to the Township of Whitchurch, a distance of thirty miles, was opened on the 16th of May last, and the amount of business done, during the short period which has intervened, indicates the most satisfactory results.

The second section, from Whitchurch to Bradford, should, by the terms of the original contract, have been ready for opening on the 15th of May, 1853 , but in consequence of the changes made in the location to improve the alignment of the Road, requiring the formation of heavy embankments, it was agreed in a supplementary contract, that the time for completing this division should be extended so much as the Chief Engineer might decide to be reasonable. Such an extension of time would not have been necessary, but for the very unfavorable weather during the spring, and the unusually heavy fall of rain, which has caused a greater amount of subsidence in these new embankments than was anticipated. The iron is now laid on this division of the Road to within about two miles of the Holland River, and will, without doubt, be laid to that point, and be put in order for running over, on or before the fifteenth day of June, instant.

From Holland River to Barrie, with the exception of those sections where changes in the original location were made, the bridging and grading is very nearly completed, and the whole of this division, which, by the terms of the original contract, should be completed by the first of December next, will, I have every reason to believe, be ready for opening at least two months previous to that time.

In order to facilitate and to avoid interruption to the regular business of the Road, the arrangement ordered by the Board, has been made with the contractors for taking the Roads off their hands as far as Barrie, without ballasting, for the consideration agreed upon. The ballasting will now be done by the Company at such times as the business of the Road may best admit or require. With a similar purpose, two of the minor changes, in the original location, required by the supplementary contract, have been postponed, and the contractors having placed their estimated cost at the credit of the Company, the track has been laid on the original location, which was graded, and the improvements will be made at a more convenient season.

From Barrie to Collingwood Harbour, on the Georgian Bay, a distance of thirty-one miles, the location has been completed, and the works are in satisfactory progress on this division, with a fair prospect of being completed by the time stipulated in the contract, viz., the 1st day of June, 1854. On this portion of the Road, the alignment and grades have been greatly improved over those indicated by the preliminary survey, and the country through which it passes, is generally favorable to the construction of such a permanent way. as will be economically maintained, and requiring the construction of but 452 feet of bridging on the entire division.

* * * * * * * *

It is not contemplated to proceed at present with the construction of any very extensive work at Collingwood Harbour. No greater outlay this year will be incurred at that terminus than will be necessary to afford a good steamboat landing, and sufficient storage for goods, This course has been deemed advisable, inasmuch as the bill recently passed through both branches of the Legislature, authorizes the extension of your Road to the eastern shores of Lake Huron ; and the advantages offered by such an extension may at an early date be a sufficient inducement to extend your Road to some point near the "*Saugeen*" or "*Fishing Islands.*"

* * * * * * * *

The rolling stock at present on the Road consists of four engines and fifty-nine cars of the several classes ; besides which, thirty-six other cars are in a forward state in the contractor's shops, and will be on the Road within the present month. Contracts have been made with Messrs. McLean, Wright & Co. for two hundred and eighteen cars ; and as they have their shop and machinery in full operation, no difficulty is likely to occur in fully equipping the Road. Four other locomotives have also been ordered, three of which will be in service before the expiration of this month, and the fourth early in July.

The recent report of the Chief Engineer fully detailed the expenditure required for completing the road to Collingwood, nothing has since occurred calculated to disturb that estimate. The expenditure as exhibited by the books of this office to the present time, is as under :

For Grading, Bridging, and permanent way, including Engineering expenses, and Rolling Stock under original contract, and iron for eighty-two miles of road, with sidings,	417,542
For Rolling Stock under supplementary contract, ...	4,070
For Harbour and Depot service, under supplementary contract, being for permanent and temporary work in Toronto, and for Way Stations, ...	2,254
	£423,866

All which is respectfully submited,

ALFRED BRUNEL,

Chief Assistant Engineer.

ENGINEER'S OFFICE,
Toronto, June 4th, 1853.

Great Western Railway.

At the annual general meeting of the Stockholders of the Great Western Railroad, held in Hamilton, a few days ago, reports were adopted, of which we present the following extracts :

The Directors, in submitting the usual financial statement, made up to the 30th April last, will, in explaining their proceedings during the past year, endeavor to place before the Stockholders the exact and real position of every matter connected with the Road.

The amount expended up to the date of the last Report, in June, 1852, was......... ... ...£ 383,039 8 5

From the accounts this day submitted, it will be seen

that the total expenditure, to the 30th of April, 1853, was.................. £1,322,758 2 10

There has consequently been expended during the past twelve months.............. £ 939,718 14 5

It will thus be seen that a very large amount of work has been performed since the last annual meeting, and the progress made up to this time has been such as to admit of the works being pressed forward during the present season with the greatest possible rapidity. All the large and important structures are advancing rapidly towards completion—the grading of a considerable portion of the line is in a forward state—so much so that the superstructure has been commenced at several points, and arrangements are in a forward state for vigorously carrying on this work along the whole line. By far the largest portion of the rails, which are of a very excellent description, and were purchased at a low price, before the late extraordinary advance in the price of iron, is delivered at various points on the line, and the balance is now on its way from England via Quebec.

The Directors therefore feel themselves justified in expressing a strong and confident belief, that by the adoption of the most energetic measures to press on the work, they will, if no unforseen contingencies arise, be in a position to open the line from Niagara to the Detroit River by the 1st of January next.

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ENGINEER'S REPORT.

To the President and Directors of the Great Western Railway Company

Gentlemen,—* * * * The late period in 1852 in which I assumed the duties of Chief Engineer, left but little time hitherto except during those seasons of the year unfavorable to operations of this kind, to press forward the work on the line with as much energy and expedition as was desirable.

Some difficulties have existed during the past fall and winter with some of the Contractors on the Western Division of Road, but these have been adjusted, and the work is in full progress on that portion of the line—its completion may be reasonably anticipated at the period hereinafter named.

The line of your road cannot be opened for use by the time indicated in the last annual report from this office, nor has there ever been a period within the last twelve months when any such opinion ought reasonably to have been entertained. Even the grading on the one hundred miles from the Detroit river east, has not yet been completed, and probably will not be before the first of September next.

The report and estimate made by my predecessor on the 30th of September last, gives an estimated increase in the cost of the road of $1,129,173,01 exceeding any sum before deemed necessary to complete the enterprise. The amount of work required to be done under this increased outlay, no doubt satisfied every friend of the road familiar with works of this kind, that the opening of the whole line by the close of the year 1853, would be exceedingly problematical, and dependant upon contingencies that might defeat all the applications of science, skill and labour that could well be devoted to the accomplishment of an object so anxiously desired, and so important to the interest of the company. This being perceived, every precautionary measure deemed essential and within my power, has been adopted to expedite the progress and completion of the work, that a strict regard to economy in expenditure and the permanence of the road combined has seemed to be required.

As the periodical subsidence of the waters of the western lakes had not occurred in 1852, and it probably will not, according to all former experience, during the present year, a plan was adopted by my predecessor, for piling about 14 miles of the line over the wet praries west of Chatham on the Western Division.

The slow progress made in the work, and its probable insecurity and want of permanence for the purposes of operating the road with desirable security, safety, and expedition, induced me to recommend a change in the plan of construction, and the whole distance through the prairies, with the exception of a mile and a half, will be graded in a permanent manner, either by taking materials to form the embankment from the prairies adjacent to the line of road, by means of coffer dams and pumping, and with dredging machines, or by hauling beach sand from the shore of the Lake. This change will increase the cost of constructing on the part of the line considerably above the sum estimated by my predecessor for a pile road; that being only one dollar per lineal foot; but the cost I think will not exceed what would eventually be required to render a pile track safe for the rapid transmission of trains.

The one is permanent for all time to come, the other temporary, and will require filling in within a few years.

* * * * * * * *

The completion of the City Section on the Central Division, in connection with the opening of the new channel of the Desjardines Canal, through Burlington Heights, and the drawbridge connected therewith have continued to excite my most lively solicitude. Under favourable auspices and with the application of proper means and an adequate force, this work can be got ready for laying down the superstructure in time to connect with other portions of the line westward, by the 1st day of January, 1854. In order to avoid obstructions and embarrassments, as well as to guard against a large expenditure of money, consequent on the heavy slides on sections three and four, near Dundas, slight alterations have been made in the line of the road, with the view, at some future period, after the surface water shall have a proper drainage, and the moving mass has become settled and compact, of placing the track upon the original lines, if deemed necessary.

Sections five and six, Central Divisions, embracing the Copetown work, which has heretofore attracted some attention, have thus far presented objects serious in their character and difficult to overcome.

The increased quantity of material required to be excavated and removed, occasioned by the large and continued slides of earth in the deep cutting, and the piling necessary to protect the foot of the slopes and maintain the required width of the road way, will enhance very much the cost of the work beyond all former estimates.

This work, however, is in such a state of forwardness as to justify the expectation that no serious delay in opening the line on this Division will be occasioned by the obstacles there to be encountered and overcome.

The sinking of the embankment on section 11 Central division, into a deep morass or subterranean lake, has heretofore shown unmistakeable evidences of serious difficulties. A new plan for carrying forward the work has been recently adopted which promises fair, not only to expedite it, but very much reduce the expense. This has been done by constructing an extensive platform of evergreen trees and brush, so interwoven its roots with earth as to prevent the loss of material by displacement, which was occasioned by the nature of the material used and the superabundant weight put upon the basis of the embankment beyond its capacity to sustain.

Present indications show the entire success of the plan; and we hope to complete the grading at that place by the first of September next.

The work on the Western Division is of such a character, and in such a state of progress, with the exception of the deep and difficult excavations on sections two and three, near London, as to present no serious apprehensions that this portion of the line will be in condition to be operated upon by the close of the present year. And as to those points, new arrangements have been made with the contractors, to facilitate the progress of the work; and if need be, further attainable means may be resorted to by the application of a night force, so that the opening of the line West of London may be simultaneous with that between Hamilton and London.

On the whole, then, if the financial arrangements of the Company shall be such as to allow the work on this part of the line to be pushed to the extent required, and no other casualties or obstruction shall intervene or occur than such as may be reasonably anticipated and guarded against, I see no just cause to doubt you can be gratified with the opening of the whole line, from Windsor to Hamilton, by the close of the present year.

* * * * * * * *

I submit therewith a detailed account of the cost of the entire line between the Niagara and Detroit rivers, two hundred and twenty-eight miles, and the Galt branch twelve miles. This estimate is intended to cover all items of expenditure requisite to put the line in complete operation, with buildings and equipments complete, including the docking and filling in depot grounds at Hamilton and Windsor, and the extension of the line down the Detroit river to a point opposite the Michigan and Central Railroad station.

The right of way, land and land damages, and the incidental and contingent expenses of the Company are not included in the estimate.

According to this estimate the cost of two hundred and forty miles of single track road, with an allowance of 17 miles of superstructure

for side tracks, &c., will amount to the sum of $7,791,075.14 which is composed of the following items :—

Grading, Masonry and Bridging,	$1,477,138 49
Superstructure,	1,795,186 65
Fencing and Gates,	153,600
Station Buildings, Engine and Freight Houses, Machine Shop, Car Factory, &c.,	375,000
Stationery Engines, Machinery, Tools and Turn Tables,	48,000
Rolling Stock,	662,150
Engineering Expenses and pay of Inspectors of Work,	280,000
	$7,791,075 14

The increase of Mr. Benedict's estimate of the 30th Sept. last, is as follows :

On Grading, Masonry and Bridging,	$653,799 83
On Superstructure	320,717 65
On Fencing,	20,413
On Buildings,	115,000
On Rolling Stock,	195,250
On Engineering Expenses,	40,000
	$1.345,180 48

In submitting this report, I have felt compelled to speak plainly and explicitly on all topics discussed ; in my judgment this was a duty alike due to the Board of Directors, the Shareholders and myself. All my exertions must be directed to the promotion of the permanent interests of those who furnish the means to carry forward to completion the great work in which you are engaged. Notwithstanding the increased outlay, according to the estimates now submitted, will reach a sum considerably larger than had ever been anticipated by the friends of the enterprise, we may indulge in the well grounded hopes that with the application of reasonable economy in our future operations and with an energetic and cordial co-operation among all the official departments of the company, the whole line of road will be open for traffic at an early day, and this noble enterprise may be made to yield a fair increase on the capital invested.

Respectfully submitted.

(Signed) JOHN T. CLARK,
Chief Engineer.

Engineer's Office, G. W. R.,
Hamilton, 4th June, 1853.

Toronto and Guelph Railway.

Report of the Directors of the Guelph Railway Company—June 6.

This is truly an exulting and abounding river of words. It is far, very far removed from the subdued goodness, not to say *softness* of the Report of the Northern Railway Board. It speaks in a tone of undisguised, and even affectionate triumph of the wonderful sagacity of the BALANCE—to which it appears the favourable solution of all the vital questions affecting the very existence of the Guelph line are gratefully due.

We begin at the end of the Report, struck as we were with the late singular exigencies of the Guelph line, so distinctly delineated in the closing paragraph, which we subjoin:—"When it is felt, as your Board feel, that all these vital questions have been decided in our favor, by the mere wavering, as it were, of a BALANCE, which a moments delay or a brief indiscretion might have turned against us, &c., &c., &c."

The principle is evidently borrowed from the Bank of England Sovereign Weighing Machine, a short description of which we give in the present number of the Journal. The Report says nothing about the ingenious inventor, but with quiet humour, tinged with exultation, thinks that the Balance was *'discreet.'*

It may be so, but the aspect of coming times is not so undisturbed to our mental vision as it appears to the Directors of the Guelph Railway Company. Something we fear 'looms in the future,' and may not the Great Western Railway form a part of that shadowy veil which we believe is destined to suppress with "cold obstructions apathy" many of the aspirations of the *Canadian* Shareholders, and especially those interested in that particular portion of the line which is *destined* (?) to run from Stratford to Sarnia.

The Board thus speak for themselves :—

"The Board of Directors, in laying before the Shareholders of the Toronto and Guelph Railway Company, a statement of their transactions for the past year, do so with no ordinary feelings of pride and gratification, at the commanding position and future importance which, in the brief period of their term of office, this infant enterprise has secured. When twelve months ago, the Directors assumed their onerous trust, it was generally understood, that the construction of a railroad from Toronto to Guelph would be a task attended with much difficulty and discouragement, in consequence of the scarcity of capital, the limited powers granted by Parliament, and the powerful union of opposing interests. Confident however, in the intrinsic merits of the undertaking, and the vast benefits to be derived from it by the citizens of Toronto, and the inhabitants of every town and township interested, the Board set themselves steadily to work to surmount the obstacles that lay thick in their path, and the result has been, that at this moment, not only is the railroad visible as an actual fact, in a more or less advanced state, in almost every part of the line between Toronto and Guelph, not only have surveys been completed to Goderich and Stratford; and partially so from Stratford to Sarnia ; and full powers obtained from the Legislature, despite of all opposition, to extend our line to the last named point ; not only has this been accomplished, but important as these must be considered, they are only a portion of what the Toronto and Guelph Railway Company has achieved."

After some explanatory remarks the Report tells us that " under the able agency of Alex. Gillespie and A. T. Galt, Esquires, deputed by your Board, the arrangements have been all completed, the legal documents signed and delivered, subject to the sanction of the shareholders, by which the Toronto and Guelph Railway Company has become a component part of a great congeries of Railroads, extending from the Atlantic coast on the east to Port Sarnia on the west, a distance of 809 miles, with branches to Quebec, and thence to Trois Pistoles, 253 miles, and to Peterborough 50 miles, being 1,112 miles in all, independent of the large number of tributary lines which must pour in their streams of travel, from Hamilton, from Goderich, Port Hope, Cobourg, Rawdon, &c., besides the connecting links which will unite our line with the Railroads of Nova Scotia, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Ohio, Michigan, and Wisconsin, all situated within reach of one or other of its various tributaries.

* * * * * * * * *

On the 4th of May, letters were received, announcing the effective accomplishment of the contemplated arrangements, by the completion of an agreement, subject to ratification of the Stockholders of this Company, by which the entire interests of this Company became merged in those of the Grand Trunk Railway of Canada, and the Municipalities have been enabled to exercise their free choice in retaining or resigning their stock. Those letters your Board have appended to this Report, with the view of affording every proprietor of shares the fullest insight into the nature of the changes involved. By them, all the previous contracts with Messrs. Gzowski & Co., together with all the financial arrangements contingent thereupon, have been set aside, and a new contract substituted, establishing a mileage rate, for the construction of the Railway from Toronto to Sarnia, of £8000 sterling per mile, including all expenditure for the erection of stations, purchase of lands, cost of tubular iron bridges for double track, and other works, upon the scale adopted for the Grand Trunk Railway ; besides a sufficient sum to provide for the payment of interest on the entire stock until the line is opened throughout, and an amount not exceeding £15,000 sterling for the current expenditure of the Company, or the payment of salaries, rent, stationery, and all other incidental outlay."

Then follows an account of matters of detail, which are not of interest to the general reader. The report closes with a song of triumph and rejoicing, which we trust future events will show to be suitable, seasonable and sincere.

"Perhaps no circumstance connected with the history of your Company for the last year, is more significant than the fact, that whereas a few months since, it was with difficulty that even wealthy individuals could be induced to invest their capital in railroad stock at all, and the sole motive which induced the citizens to consent to give municipal aid, was, the indirect benefits to be obtained from Railroads ; we now find many of the same individuals then most opposed to holding stock now unwilling to dispose of it at par with interest. When so striking a change is kept in view : when too the formidable obstacles which have been surmounted, in the selfish opposition of powerful and extensive rival combinations, are remembered—when the commanding position of the City of Toronto, as a central station of the Grand Trunk Railway of Canada, as contrasted with what it must have been, if reduced to a rank subordinate to a neighboring city, is considered—when it is felt, as your Board feel, that all these vital questions have

been decided in our favor, by the mere wavering, as it were, of a balance, which a moment's delay or a brief indiscretion might have turned against us, then truly every shareholder of this Company, every inhabitant of each town and city on the line, ought to rejoice at the result.

Your Board feel that they have done their duty, and they yield up their charge in the full confidence, that their acts will meet with the entire approbation of the stockholders, and their fellow citizens generally."

All which is respectfully submitted.

By order,

S. THOMPSON,

Secretary.

Toronto, June 6, 1853.

Hamilton and Toronto Railway Company.

REPORT OF THE BOARD OF DIRECTORS.

The Directors place before the Shareholders a statement of the accounts made up to the 31st May, by which it will appear that only preliminary expenses have yet been incurred. The contract with an eminent English contractor has been approved of and adopted by the Directors; and arrangements are in progress for vigorously prosecuting the work. The Directors have to report that they have arranged to lease the Line when finished to the Great Western Railway Company, at a rent of 6 per cent. on the guaranteed cost of the road, and an equal participation in any dividend beyond 6 per cent. that the Great Western Railway may pay to its shareholders, and which lease they strongly recommend for the adoption of the annual meeting of Shareholders. The Directors have to congratulate the shareholders on the contemplated arrangements between the Great Western Railway Company and the Grand Trunk Company, by which rivalry, injurious alike to the public and to the shareholders, will be avoided, and the stability of Railway property in Canada secured.

All of which is respectfully submitted.

ROBERT W. HARRIS,

President.

CORRESPONDENCE.

"Rara Avis."

To the Editor of the Canadian Journal:

SIR,—I was highly interested in the account of the Land Birds wintering in the neighborhood of Toronto, read by G. W. Allan, Esq., Feb. 28th, 1853. Though aware that some of the birds enumerated might winter with us in the dense forests of cedar and hemlock in Canada east, yet, I had no idea that so great a variety, as twenty, could be found near Toronto, although nearly two degrees more to the south.

The perusal of Mr. Allan's paper brought to my mind an ornithological curiosity which characterized the winter of 1851–52, and which, being so very rare and uncommon, if not without a parallel, is certainly worthy of being recorded. It is nothing more nor less than the fact of a Robin red-breast remaining with us about the Rectory, and enduring the rigours of the whole winter—by no means a mild one. At first sight of the bird I could scarcely believe my bodily vision; yet was soon convinced of what I imagined it to be, namely, what Thomson so graphically portrays in his "Winter," the season, in England, when this general favorite seeks a more intimate acquaintance with the human family:

"The red-breast, sacred to the household gods,
Wisely regardful of th' embroiling sky,
In joyless fields, and thorny thickets, leaves
His shivering mates, and pays to trusted man
His annual visit. Half afraid, he first
Against the window beats; then brisk alights
On the warm hearth; then hopping o'er the floor,
Eyes all the smiling family askance,
And pecks, and starts, and wonders where he is:
'Till more familiar grown, the table-crumbs
Attract his slender feet."

I was anxious to ascertain what had become of the other robins, and after the lapse of a day or two, the melancholy conclusion was forced upon me, that, sure enough, this careless child of nature had lost the main chance, and suffered his parents, relations, and neighbours, to migrate to their annual resort for the winter, and that my poor friend was truly the *last Robin of Summer*, or rather Autumn, left shivering alone. I called the attention of my family to the affecting fact, when general sympathy was felt for the solitary bird, and fear expressed that the intensity of the cold would number him with the dead.

Fortunately, the berries of the mountain ash in front of the house, afforded an ample supply of food to Bob through the winter, till the cedar-birds came to feed on them, as they generally do towards the end of the season. Several times a day he enjoyed his meal, with apparent relish and gratitude, always returning to his roost, which was generally the lowest branch of a plum or cherry tree, in the rocky part of the flower garden.

On intensely frigid days, with a piercing cold wind, or when the mercury was down to ten or twenty degrees below zero, the effect on poor Bob was truly affecting to witness. Once or twice especially, while perched on the cherry tree, the frigidity of the atmosphere had so thickened his blood and benumbed his frame, that he could not maintain his proper roosting position; but with feathers ruffled, and head dropping gradually lower and lower—just like a person nodding while dozing, but raising up his head less and less high, as sleeps gets the mastery—gave sad intimation that the last fatal sleep of death was upon him! when, lo! he would rouse himself as if by a desperate effort, and, recovering his vivacity and strength, have recourse to his favorite and only remaining food, without which he certainly must have perished.

His nocturnal repose, I have reason to believe, was in a neighboring barn or stable, distant some twenty rods, since his flight about dusk was in that direction, and from thence back again at twilight, a.m.

Thus like a brave pilot, he weathered the storms and bitter cold of winter, unscathed by their severity. When Spring came, with the return of his *wiser* and more favored kindred, we lost sight of our feathered hero, who had given ample proof how much hardness he could endure.

It would have afforded us much pleasure could we have related the warm congratulations of his brethren, on again recognizing this long lost member of their fraternity—*the last Robin of Summer.*

RICHARD WHITWELL.

Philipsburgh, 22nd April, 1853.

Installation of the Chancellor of Trinity College.

Owing to the non arrival of the Steamer, in due time on Thursday, by which the Chancellor elect was a passenger, the installation of the Hon. J. Beverly Robinson, Chief Justice of Upper Canada, as the first Chancellor of this University did not take place until Friday last.

At Ten o'clock, the Lord Bishop, the Chief Justice, the Provost and heads of the University, the Students and company having assembled in the College Chapel, the Liturgy was there said, after which the Bishop, Clergy and Students having adjourned to the Hall where a large company was assembled. his Lordship took the Chair. Shortly after the Chancellor entered in his splendid robe of office, the gift to the College of various liberal friends. Immediately upon his entrance, the Lord Bishop vacated the chair and the Chancellor being led thereto, took his seat, with the Lord Bishop and the Archdeacon of Kingston on his right, the Vice Chancellor and Archdeacon of York on his left.

* * * * * * * *

The Chancellor then proceeded to confer degrees when Messrs. Badgley, Bethune, Hallowell, Hodder, and Deazley, Medical Professors of the University were severally introduced by Dr. Bovell, and having taken the oaths and declarations, severally received their degrees of M.D., in this University, *ad eundem*, and also Dr. Bovell who was presented by Dr. Badgley.

Professor Hind then received the degree of M.A., and Mr. J. M. Strathy that of Musical Bachelor.

The following gentlemen also received the degree of B.A., Rev. Messrs. Merritt, Ingles, Geddes, McKenzie, and Messrs. Helliwell, C. Robinson and Preston. The following being of sufficient standing in the College also received the degrees of M.A., Rev. Messrs. Merritt, Geddes, McKenzie, Messrs. Helliwell and C. Robinson.

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We cannot close our report of the proceedings of this day without making mention that it having been recollected that this was the fif-

tieth year of the ministration of the Lord Bishop in Canada, it was proposed to commemorate the event by founding in Trinity College a Scholarship to be denominated "The Bishop Strachan Jubilee Scholarship," value £30 a year for which purpose the sum of £500 was proposed to be raised by subscription. A subscription list was immediately opened, and the amount was subscribed in the room.

At the meeting of the friends of the College which was held after the installation, it was decided to raise at once by voluntary subscription the further sum of £5,000 in aid of the funds of Trinity College, and the sum of two thousand pounds was subscribed before evening. Since then we understand the subscription list is fast filling up.—*British Canadian.*

University College, Toronto.

The following appointments have been made by His Excellency the Governor General, in University College, Toronto:—

"J. Bradford Cherriman, Esq., M. A., Fellow of St. John's College, Cambridge, to be Professor of Natural Philosophy in University College, Toronto.

"Daniel Wilson, Esq., L. L. D., Honorary Secretary of the Society of Antiquaries in Scotland, to be Professor of History and English Literature in University College, Toronto.

"The Rev. William Hincks, F. L. S., Professor of Natural History in Queen's College, Cork, to be Professor of Natural History in University College, Toronto.

"Edward J. Chapman, Esq., Professor of Mineralogy in University College, London, to be Professor of Geology and Mineralogy in University College, Toronto.

"James Forneri Esq., L. L. D., to be Professor of Modern Languages in University College, Toronto.

Government aid to various Institutions for the advancement of knowledge in Canada East and West, 1853.

Aid to the	Literary and Historical Society at Quebec,	50
do	Natural History Society, Montreal,	50
do	Mechanics' Institute at Quebec,	50
do	same at Montreal,	50
do	same at Kingston,	50
do	same at Toronto,	50
do	same at London, Canada West,	50
do	same at Niagra,	50
do	same at Hamilton,	50
do	same at Belleville,	50
do	same at Brockville,	50
do	same at Bytown,	50
do	same at Cobourg	50
do	same at Perth,	50
do	same at Picton,	50
do	same at Guelph,	50
do	same at St. Thomas	50
do	same at Brantford,	50
do	same at Catherines,	50
do	same at Goderich,	50
do	same at Whitby,	50
do	same at Three Rivers,	50
do	same at Simcoe,	50
do	same at Woodstock,	50
do	same in the County of Peel,	50
do	same at Port Sarnia,	50
do	same at Chatham,	50
do	same in the County of Halton,	50
do	same in the County of Ontario,	50
do	same at Port Hope,	50
do	Athenæum at Toronto,	100
do	Huron Library Association and Mechanics' Institute	50
do	Teachers' Association at Quebec, for their Library,	50
do	Canadian Institute at Toronto,	250
do	Canadian Institute Quebec,	50
do	Canadian Institute, to their Library,	100
do	Academie Industrielle de St. Laurent, for the years 1852 and 1853, at £150 per annum	300
do	Academie Industrielle, towards their building	150
For the re-organization and temporary maintenance of the Scientific Observatory at Toronto		2000
To reimburse Captain Lefroy, in charge of the Magnetical Observatory, the value of certain additions made by him to the building of the Observatory at Toronto, as a residence for the officer in charge,		249
To the Literary and Historical Society at Quebec, as an aid for the removal of their Library and Museum,		150
To the Natural History Society at Montreal, towards their building		150
Towards to the establishment of an Experimental Farm at Toronto,		£500
		£6349

Gold in England.—At a late meeting of the Poltimore Copper and Gold Mining Company, the result of the reduction of 50 tons of auriferous gossan, from the mine, was produced to the meeting in the shape of a piece of pure gold weighing 26½ ounces. The following is the postscript to the report of Messrs. Rawlins & Watson, at whose works the auriferous gossan was reduced:—

P.S.—In order that the company may have additional data for forming an opinion respecting the value of the gossan, we add that we are willing to undertake the reduction of the red ore, containing the same proportion of gold as the lot we have reduced, and return to the company 1 oz. of gold per ton of dry ore, free of all smelting charges; or we should be willing to give at the rate of £4 4s. per ton of dry ore. Now, assuming that the cost of the raising and carriage of the ore would amount to about £1 per ton, this would cause a nett profit of £900 per week, or upwards of £46,000 per annum, and this from auriferous ore alone, irrespective of any copper or other lodes.

As a proof of our confidence in the undertaking, we now take the 500 shares in the company which were placed at our disposal.—R.&W.

The Fine Arts in Finland.—At Helsingfors, say the foreign journals, has just been opened an Exhibition of the Fine Arts—the first that ever took place in Finland. Of fifty-two pictures which compose it, forty are by native artists:—a fact sufficiently noticeable in a country where but a few years ago so little was known of Art that the very street sign-boards were imported from abroad. It is also noticeable, that of these forty about two-thirds are the works of fourteen young ladies, nearly all of the old nobility of Finland.

Coloured Snow, Rain, and Hail.—In the *New York Journal o, Commerce*, of the 2nd ult., an extract is given from the *Boston Journal* in which it is mentioned that a fall of black snow occurred at Walpole N. H., on the 30th March. The account forwarded to Boston was written with a solution of the snow as it fell, and had the appearance of having been written with pale black ink. It is also mentioned in the *Journal of Commerce* of the above date, that after the prevalence of a rain storm in Cincinnati, in the latter part of March, the pavements throughout the entire city were found to be strewn with a yellow substance resembling sublimate of sulphur, but which was ascertained on examination, to consist of pollen of flowers, wafted by the winds from a tropical region to the north. Many earth worms were likewise deposited on the pavements by the same rain. This yellow rain extended also to Louisville, Kentucky.

Mock Suns.—The following accounts of this rare phenomenon, observed on two successive days, February 14th and 15th, at two place in England, are taken from letters addressed to the *Times* by the respective observers, Mr. Emerie S. Berkeley, of King's Cliffe, Wandsford, Northamptonshire; and Mr. John Thornton, of Kimbolton, Hunts. The latter says:—

"About a quarter past 12 P. M., this day, (Feb. 14), my attention was called to a beautiful appearance of four parhelia, situated at different points, of a great circle of bright light, parallel with the horizon, and passing through the sun. Around the sun was a vertical arch of white light, in breadth about one-third the diameter of the sun, and at the intersection of this circle with the horizontal one the two most southerly parhelia were situated; these were very brilliant, of a fawn colour towards the sun, and of a violet white on the remote side; the two more northerly parhelia were much fainter. There was at the same time in the zenith a beautiful circular ring, not very distinct towards the North, but shewing brilliant prismatic colours towards the South. The diameter of this ring, which was horizontal, was apparently the same as that of the vertical circle in which the two most southerly parhelia were situated. From further observations, taken at 2.45, P.M., the angle between the parhelia was 48°.20′. At the same time the angle between the sun and the nearest point of the prismatic ring in the zenith, was 47°. The air was very keen during the day, and at 10 A. M., the thermometer stood at 28 F., in the house."

The other account says:—

"At 12 o'clock this morning I perceived on either side of the sun

two parhelia or mock suns; these were in their usual places in two intersections of the halo; in each parhelion the colours were prismatic. Higher in the heavens, touching the halo, was an arch of an inverted rainbow; and still higher, with the prismatic colours much more vivid, was another inverted arch. These two inverted arcs were as distinct in colours as the common rainbow, but not of the same breadth. There were various other circles not well defined. Verging towards the North was a third parhelion, not consisting of prismatic colours, and in which we could not trace the intersecting circles distinctly. The clouds in the North were at the same time tinged with red. The parhelia lasted more than an hour."

Extraordinary Length of Wire from one Piece of Metal.—A remarkable specimen of the ductility of copper was manufactured last week at Mr. Walker's mills, Fazeley-street. The metal referred to weighed about 123 lbs., which was drawn out to a length of upwards of four miles, and is to be laid down as a line of telegraph without link or weld.

A method has lately been introduced in Prussia of printing books on linen prepared for the purpose. It is the invention of an apothecary named Sänger, of Berlin, and is found very admirable in large schools for the poor. The appearance of the book is by no means injured, and the price is the same as if printed on paper.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—May, 1853.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario: 108 feet

Magnet	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M.	MEAN	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Wind. 6 A. M.	2 P. M.	10 P. M	Rain in Inch.	S'nw in Inch.
						°	°	°	°													
b	1	30.074	30.071			37 0	43 8			0 191	0.193			87	69			NE b N	E S E		- -	- -
bd	2	29 963	29 877	29.761	29.851	39 1	45 9	44.5	43.90	0 179	0.170	0 174	0.170	75	55	60	62	E b N	E b N	E b N	0.005	- -
e	3	685	.662	.701	.682	46 3	50 3	48.4	48.72	.235	.284	278	.277	75	80	83	82	Calm.	Calm	Calm	- -	- -
c	4	.748	.718	.624	.693	48.5	61 4	49.9	53 43	.236	353	279	.289	70	66	79	71	Calm	S b E	Calm	0 055	- -
b	5	.564	471	.559	.534	49 5	50.6	47 5	49 33	.327	.349	289	.31[illegible]	94	96	96	92	N	N E b E	N N E	0.400	- -
c	6	.583	.636	.695	.643	44 2	54 9	43.8	48 22	218	.271	.213	.25[illegible]	76	64	86	76	N b E	SE b E	Calm.	- -	- -
b	7	.688	.503	.285	.474	45.5	52·5	44.2	48.53	.233	.290	.272	.275	69	75	94	82	N E	N E b E	E N E	0.160	- -
b	8	233	.213			47.4	56 0			294	388			91	88			E b S	W S W	—	Inap	- -
b	9	390	.354	.373	.371	42·0	49.8	46 3	47 08	.238	.278	.293	.233	90	79	94	90	Calm	E b S	S	0.065	- -
b	10	.462	.489	.597	.522	47 8	51 6	44 5	48 15	.303	.286	243	.279	93	77	84	84	S S W	S W	N N W	0 200	Inap.
b	11	.706	.710	.635	.681	38.9	51 7	45 0	46 40	219	272	.220	.242	93	72	75	78	N b W	S b E	E b S	0.345	- -
a	12	.455	575	.742	.609	42 1	47 4	39.2	42 80	.243	.285	.188	23	92	88	79	84	N E b E	N	Calm.	0 045	- -
b	13	.851	.817	.848	.837	40.8	53.4	42 0	46 55	.193	.237	.213	.23[illegible]	76	59	81	74	Calm.	S b E	Calm.	- -	- -
b	14	.880	.837	.764	.819	43 5	62 0	47 2	51 72	.198	302	.241	.271	72	56	76	72	Calm.	S S W	Calm.	- -	- -
d	15	.706	.551			47 0	50.6			.275	.345			87	95			Calm.	Calm	—	0 135	- -
d	16	493	.418	.572	.500	55 4	69 9	57.4	62.02	.365	.467	.357	.410	85	66	77	75	S S W	S S W	Calm	- -	- -
e	17	.689	.617	.689	.670	52 8	59.6	50 3	55 10	.347	.466	.341	.387	88	93	95	90	Calm	S E	N	0 225	- -
b	18	.794	.633	361	.581	44 2	43 7	44 5	43 88	.257	.262	.270	.26[illegible]	90	93	93	92	N b E	E b N	E b N	0 975	- -
c	19	.311	.369	.660	.469	45.0	42 4	35 5	41 23	.273	252	.181	.24[illegible]	92	94	87	93	S b E	N W	N W b W	0.130	- -
c	20	.544	.518	.488	.510	39 1	56 0	44 8	47.60	.196	.261	.232	.230	83	60	79	71	N W b W	W b N	Calm.	- -	- -
b	21	.413	261	.240	.297	48 2	65 4	56.4	56 70	.269	.404	.362	.317	80	67	81	77	W	S W b S	S W	0.095	- -
b	22	.283	285			53 4	56 2			.377	.409			94	93			Calm	E b N	—	1.400	- -
d	23	.262	.469	.585	.455	51.7	57.1	46 7	52 22	345	.305	.235	.307	91	67	74	80	Calm	W b S	W b N	- -	- -
de	24	.672	.711	.766	.717	44 5	51.3	47 1	47 75	243	.280	.268	.267	84	75	84	82	W b N	S S W	N W	- -	- -
c	25	.746	.664	.604	.666	48 1	57 7	54 8	53.43	.275	.377	374	.335	83	81	90	83	N	N W	N	0 005	- -
a	26	.493	.403	.461	.448	52.4	58 9	53.1	55.97	356	.399	.377	.357	92	82	96	91	N N W	N N W	W	0.170	- -
b	27	.548	.579	.609	.582	55.5	69.3	59 2	62·12	368	.452	.380	.410	85	63	77	76	N b W	N W b N	S W	- -	- -
d	28	.618	.591	.570	.591	60.7	71.4	59.2	65.07	.453	.501	.377	.455	87	67	77	76	S W	S S E	Calm.	- -	- -
b	29	.599	.539			55.4	71 1			.365	.448			85	60			Calm	S b E	—	- -	- -
d	30	.253	.414	.726	.490	[illegible]0.5	63 2	48 8	56.00	.441	343	·229	.317	86	60	68	70	Calm	N W	N W b N	0.010	- -
c	31	864	876	.814	.852	45 1	54 9	43 4	48.80	211	.309	215	24	72	73	77	73	N W b N	E b S	E N E	- -	- -
	M	29 603	29 583	29.605	29 598	47 48	55 88	47.83	50.87	0 278	0.325	0.274	0 297	84	73	82	80	M'ls 3.62	M'ls 8 12	M'ls 2.85	4 420	Inap

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1489.22	1331.98	840.17	1101.65

Mean velocity of the wind - - 5.14 miles per hour.
Maximum velocity - - - - - 21 0 mil's per h'r, from 2 to 3 p.m. on 30th.
Most windy day - - - - - 19th: Mean velocity, 10.77 miles per hour.
Least windy day - - - - - 3rd: Mean velocity, 0.33 ditto.

* The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

* The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 30.074, at 6 A. M., on 1st. } Monthly range:
Lowest Barometer - - 29.213, at 2 P.M., on 8th. } 0 861 inches.
Highest observed Temp.- 78.4, at 12½ P.M., on 28th } Monthly range:
Lowest regist'd Temp. - 32.2, at A.M., on 13th } 46.2
Mean Highest observed Temperature - - 56.74 } Mean daily range:
Mean Thermometer Minimum - - - - - 42 55 } 14.19
Greatest daily range - - - - -28.4 from noon of 28th, to A.M. of 29th.

Warmest day - - 28th - - - Mean Temperature - 65 07 } Difference:
Coldest day - - - 19th - - - Mean Temperature - 41 23 } 23.84

The "Means" are derived from six observations daily, viz., at 6 and 8 A. M., and 2, 4, 10 and 12, P. M

Aurora observed on 3 nights. Possible to see Aurora on 19 nights.
Halo round the sun at 5 30 P.M., on the 11th
Perfect Double Rainbow at 7.25 P.M., on the 26th. Brilliant colours.

The depth of rain for this month is much above the average, and has been exceeded only in two years, 1844-49; but the number of rainy days is the greatest that has been known throughout the whole series of years, being only equalled in August, 1844.

Comparative Table for May.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity
	°	°	°	°					Miles.
1840	53.78	74.5	30.8	43 7	9	4.150	0	--	--
1841	50.77	76·2	26.6	49.6	11	2.350	1	Inap.	--
1842	49 44	74.3	30.0	44 3	7	1.275	0	--	--
1843	49 28	79.6	28.9	50·7	5	1.570	0	--	--
1844	53.80	77.7	29.0	48·7	14	5.670	0	--	--
1845	50 13	76.6	29.4	47.2	8	2.300	0	--	--
1846	55.37	78.1	34.3	43.8	9	4 375	0	--	--
1847	51.92	72.5	27.8	44.7	12	2.040	0	--	--
1848	51.12	78 5	31 9	46.6	13	2.520	0	--	4.93
1849	48 63	72 5	32 7	39 8	16	5.115	0	--	5 33
1850	48.61	76 3	31.1	45 2	7	0 545	1	Inap.	6 32
1851	52 48	73.2	28 7	41.5	12	2.950	1	0.5	6 34
1852	51.67	73.3	34 5	38.8	7	1.125	1	Inap.	4.00
1853	50.87	78.4	38 4	40.0	17	4.420	1	Inap.	5.14
M'n	51.69	75.84	31.01	44.83	10.5	2.886	0.4		5.34

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, May, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 *deg.* 32 *min. North. Longitude*—73 *deg.* 36 *min. West. Height above the Level of the Sea*—118 *ft.**

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Velocity in Miles per Hour.			Rain in Inch.	Weather, &c.—A cloudy sky is represented by 10; a. cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2. P.M.	10 P.M.	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P.M.		6 A. M.	2 P. M.	10 P. M.	
1	30.103	30.020	30.019	30.0	46.0	35.0	.177	,303	.222	.95	.93	1.00	N W	N W	N W	10.57	10 54	10.74		Clear.	Clear.	Cl. ft. A. L.	
2	.072	29.910	29.882	38.0	60.0	45.0	.2 0	.467	.315	.96	.89	1.00	N N W	SW b W	SW b W	0 86	0 80	0.90		Clear.	Clear.	do. Bril. A.	
3	29.912	.743	.777	47.0	51.0	42.0	.291	.337	.283	.86	.87	.98	N E	N E b E	N E b E	0 30	3 12	3.56	0.100	Str. 10.	R. 1 45 p.m.	Slight R'n	
4	.812	.806	.807	45.0	52.6	46.5	.292	.328	.330	.93	.78	.96	N E b E	W N W	S W	2 8	Calm.	1.00		C. Str 10.	C.C. St. 9.	Cl. Au. B.	
5	.804	.729	.703	46.0	55.0	45 5	.319	.413	.320	.97	.93	.93	N E b E	N E b E	E	0.64	10 10	1.08	Inap.	Str. 4.	Str. Rain.	Str. 4.	
6	.702	.669	.732	45.0	60.0	46.1	.300	.393	.282	.96	.75	.86	N E b E	N E b E	N b W	8.67	7.13	2.82		Clear.	Cum. 4.	Clear.	
7	.790	.713	.602	47.3	67.5	53.0	.291	.445	.316	.86	.67	.77	N E	S S E	S S E	Calm.	0 87	1.13		Clear.	Cir. C. 2.	Str. 6.	
8	.452	.396	.406	45.5	55.8	47.0	.298	.364	.321	.93	.80	.96	S S E	S S E	S S E	6.25	7 64	11.25	0.103	Shower.	Cum. Str. 2.	Cum Str.4.	
9	.442	.504	.524	52.6	66.2	50.2	.352	.464	.332	.85	.71	.89	SW b W	W b N	S W b S	0.65	2.88	1.65		Cirr. 2.	Cum. Str. 7.	Clear.	
10	.564	.596	.599	50.0	69.0	55.0	.352	486	.394	.95	.69	.88	SW b S	SW b W	SW b W	5.62	5.43	4.00	0.086	Shower.	Cir. Cum. 4.	Str. 10,	
11	.644	.657	.738	51.0	57.2	44.1	.315	.376	.241	.81	.79	.79	W	W	N N W	5.00	8.95	9.19		Clear.	Cum. Str. 4.	Clear.	
12	.773	.504	.653	41.0	44.3	40.1	.241	.282	.250	.90	.92	.98	N E	N E	N W	5.51	2.14	12 22	0.509	R. 6 40 a.m.	Cum. Str. 2.	Overcast.	
13	.820	.806	.809	36.0	57.0	49.2	.220	.376	.312	.96	.79	.86	N W	W N W	W S W	7.61	9.80	7.39		Clear.	Str. 10.	Clear.	
14	.832	.783	.774	51.7	64.0	54.2	.337	.460	.373	.87	.77	.87	W	W N W	S S E	3.45	11.82	5.80		Overcast.	Cum. Str. 2.	Cum. 2.	
15	.823	.652	.505	53.0	80.0	57.0	.361	.753	.450	.87	.75	.96	S S E	S S E	S W b W	0.26	3.06	4.62	0.319	Cir. C. 4.	Cirr. 2.	Cl.S. 6 p.m.	Thunder at 6 p.m.
16	.476	.364	.380	70.2	83.0	67.0	.659	.681	.534	.90	.61	.81	W S W	W S W	W S W	5.79	18.86	21.42		Clear.	Cir. Cum. 4.	Overcast.	Do. do. 7 15 p,m.
17	.706	.716	.798	57.1	73.0	42.9	.376	.572	.272	.79	.72	.92	NW b W	S W b W	N E	10 81	8.50	10.83	0.180	Str 4.	Cir. Str. 8.	R 5 10 p.m	
18	.899	.742	.719	39.4	57.9	50.0	.234	.327	.291	.91	.66	.80	N E	N E	N E b E	4.00	8.55	0.21	0.143	Strat. 9.	Cir. Str. 4.	Overcast.	
19	.397	.415	.463	40.0	43.0	39.7	.282	260	.250	.98	.96	.96	N E b W	N N E	N b E	13.96	18.08	8.78	1.459	Rain.	Rain,	Rain.	
20	.472	.457	.505	41.1	54.4	46.0	.253	.326	.282	.92	.76	.86	NW b W	NW b W	W b N	16.45	11.95	11.35	1.060	Str. 10.	Cum. 4.	Cirr. 4.	L'nr Halo dia. 63°
21	.391	.302	.314	48.4	55.5	53 2	.302	.394	.368	.86	.88	.89	SW b W	S W b S	N E	5.84	5.00	5.26	0.730	Clear.	R. 1 15 p.m.	Str Cum. 8	
22	.318	.414	.402	52.2	67.0	56.0	.351	.506	.432	.88	.76	.94	N E	W	S b W	1.35	0.22	0.85	0.200	C.C. St. 5.	Cum. 4.	Overcast.	
23	.410	.423	.554	54.6	70.0	67.1	.442	.600	.318	.98	.83	.48	N E b E	W S W	W S W	0.79	5 26	5.83	0.447	Rain.	Cirr. Str. 5.	Str. 4.	
24	.715	.742	.786	54.4	62.6	51.3	.304	.354	.315	.70	.63	.81	W S W	W b S	W S W	8.51	2.50	6 50		Clear.	Cirr. Str. 2.	Str. 4.	
25	.825	.769	.712	53.5	59.0	55.1	.315	.361	.4 8	.76	.73	.94	N E	N E b E	N E b E	1.14	9.12	5.24	Inap.	Str. 2.	Hazy.	Sl'gt Rain.	
26	.556	.421	.447	60.2	62.5	58.8	.416	.522	.460	.79	.91	.92	N E	N E b E	N E b E	6.73	13.26	14.00	0.630	Str. 4.	Rain.	Rain.	
27	.507	.538	.570	61.0	83.3	67.0	.440	.827	.520	.81	.75	.77	NW b W	NW b W	NW b W	1 97	2.14	0.64		Clear.	Clear.	Clear.	
28	.632	.56	.580	63.2	81.0	70.0	.443	.863	.551	.76	.83	.76	W b S	W b N	W b S	0 17	1.43	2.87		Clear.	Clear.	Clear.	
29	.604	.542	.528	62.2	87.8	68.8	.421	.578	.470	.75	.46	.69	W	S W	S W b W	1.14	3.73	8.86		Clear.	Clear.	Clear.	
30	.445	.302	.668	70.0	66.5	46.6	.465	.580	.246	.64	.90	.78	S W	W S W	NW b W	1.60	15.00	16.28	0.433	Rain.	Cum. 2.	Clear.	White Frost.
31	.978	.932	.927	436.	62.0	48.5	.177	.333	.281	.58	.59	.81	N E	S S W	S	5.10	2.72	3.75		Clear.	Clear.	Cl. ft. A.A.	

Barometer.
- Highest, the 1st day - - - - - 30. 03
- Lowest, the 21st day - - - - - 29.302
- Monthly Mean - - - - - - 29.644
- " Range - - - - - - 0.801

Thermometer
- Highest, the 29th day - - - - 87.°9
- Lowest, the 1st day - - - - 30.0
- Monthly Mean - - - - - - 56.34
- " Range - - - - - - 57.9

Most Windy Day—the 16th day, mean—15.35 miles per hour

Least Windy Day—7th mean—1.00 miles per hour.

Rain fell on 16 days—amounting to 6.399 inches, and was accompanied by thunder and lightning on two days.

Aurora Borealis visible on 4 nights.

Lunar Halos on one night.

Mean of Humidity—.895.
Greatest Intensity of the Sun's Rays—111.°3.
Amount of Evaporation—2.51 inches.
Most Prevalent wind—N.E. b E.
Least do. do. E.

The electrical state of the atmosphere has been marked during the month *generally* by high intensity of positive electricity, and on the 15th, 16th, 28th and 30th days indicated changes from positive to negative of a very high tension.

Galvanic Electricity.—An interesting lecture on Voltaic Electricity, was recently delivered to a numerous audience, at the Islington Literary and Scientific Institution, by Henry M. Noad, Esq., the eminent electrician and chemist. The lecturer commenced by alluding to the absurd anecdotes, which were found in every English and French writer on physics, respecting the discovery of this species of electricity—that a pupil of Galvani, while operating on the electric machine, accidentally brought a scalpel in contact with the nerve of a frog's thigh, which he noticed was immediately thrown into violent convulsions, and that the master followed up the experiment, fancying he had discovered some new principle in connection with animal vitality. This was attributing to Galvani an ignorance which he certainly did not deserve; Matteucci had practised on animal electricity long before, and Galvani, who had been studying the subject for 10 or 12 years previous to this period, was well acquainted with its principles, and all his discoveries were the result of practice, close observation, and inductive philosophy. Volta, an Italian chemist, followed up the experiments, and made many valuable discoveries. It was then shown that the development of a current of electricity could be effected without metals, a voltaic pile of flesh might be constructed which would engender a current, although certainly a weak one There was, the lecturer believed, not an electrician in this country who did not attribute the effects of the battery to chemical action, while the German philosophy was that it was only a natural result, arising from the contact of two dissimilar metals. Mr. Noad then proceeded to describe the several batteries of Smee, Daniells and Grove, the first of which was called the chemico-mechanical battery; Daniell's was the most constant, while that of Prof. Grove gave the largest amount of power, and was decidedly ecconomical, from there being no electrical action except when the circuit was complete. A variety of experiments followed, showing the heating, chemical and magnetic powers; which were performed with a Grove battery of 24 pairs, the decomposition of water, iodide of potassium, chloride of sodium, and sulphate of soda; the combustion of gold, silver, copper and iron; the electric light, and the usual apparatus for showing the extraordinary magnetic powers of a current of galvanic electricity, was exhibited. A pretty experiment was shown with a handful of nails, which being placed on a tray of card board, on the upper surface of the soft iron bars, surrounded by wire, on making the circuit could be moulded about in any direction, and an arch was formed of them, which on breaking contact, immediately fell to pieces. Mr. Noad also explained that in the most trivial actions of every day life, enormous currents of electricity were evolved; no cook could perform an operation in the culinary department, nor a joint of meat be cut, but this result took place. This was illustrated by a saucepan of milk being heated by a spirit lamp, and a wire from one pole of a galvanometer fastened to the handle; the wire from the other pole was attached to a silver spoon, and the moment the milk was stirred in the slightest degree, the needle was instantaneously and powerfully deflected. The entire lecture was a very lucid explanation of the principal details of what is at present known in this interesting science, and appeared evidently to be well appreciated by an attentive audience.

Conductability of Minerals for Voltaic Electricity.—From some researches into the conductability of minerals by M. Elie Wartmann, Professor of Natural Philosophy in the Academy of Geneva, some curious facts present themselves, and on an examination of 319 species which were submitted to direct examination by the author, the comparison of the results with those of previous experimenters shows in general a satisfactory coincidence. Where divergencies present themselves, they are to be referred to the variety of structure resulting from difference of locality, and to the fact of having employed voltaic instead of frictional electricity. The purity of the mineral operated on, exercises a great influence on its conductability, and the author, therefore, always employed well-defined crystals; the conducting powers of sulphuret of antimony, native and artificial, have been confirmed by the experiments of MM. Riess, Karsten, Munck, and Professor Faraday. The author found native crystals of realgar good conductors, while M. Hausmann estimates them as semi-conductors, and Pelletier among the insulators. Sulphuret of zinc is a conductor or an insulator, as it is prepared in the dry or humid manner: black sulphuret of mercury conducts well, while red cinnabar is a perfect insulator. The other sulphurets exhibit the same peculiarities. In conducting these experiments, numerous difficulties presented themselves, and curious variations occurred in examining the same mineral; he found some crystals perfect conductors, and others, of the same appearance, which arrested the most intense currents, until, by the continuous friction, the surface was abraded. Some beautiful crystals of oxide of tin proved conductors along their edges, and in places on their facets, but everywhere else insulators; while the variable adherence of the surfaces of cleavage sometimes modifies the conducting power in the most capricious manner. The deductions arrived at from these experiments are,—that the conducting minerals belong to five primitive crystalline types; that minerals present all intermediate degrees between perfect conductability and perfect insulating power; that all native metals and their alloys are conductors; that among metallic oxides much difference exists, those opake and lustrous generally better conductors than others; metallic sulphurets the same; the chlorides partly conductors and partly insulators; salts the same, the majority being insulators; that the molecular state determines the character; diamond insulates, graphite conducts well; that among minerals of vegetable origin, the more perfect the carbonization the better the conducting power; and that among the conducting minerals which do not crystallize regularly, some present differences of conductability, when the direction of the current through the mass is varied.

Deep Sea Soundings.—The Royal Society was lately entertained by Cap. Denham, R.N. of H.B.M. ship Herald, with an account of his experiences in deep sea soundings. The expedition under Capt. D. was particularly directed to observe soundings, and it was very successful. The deepest was attained on a calm day, Oct. 30, 1852, in the passage from Rio Janeiro to the Cape of Good Hope. The sounding-line, one-tenth of an inch in diameter, was furnished by Commodore McKeever, U.S. N., commanding the frigate Congress. The plummet weighed nine pounds, and was eleven inches long by one-seventh of an inch diameter. When the depth of 7,706 fathoms was reached, the plummet touched bottom. Captain Denham states that Lieutenant Hutcheson and himself drew up the plummet fifty fathoms, but it indicated the same depth after each experiment. The velocity of the line was as follows:—

	Hours.	Minute.	Seconds.
The first 1,000 fathoms in........	0	27	15
1,000 to 2,000 "	0	39	40
2,000 to 3,000 "	0	48	10
3,000 to 4,000 "	1	13	39
4,000 to 5,000 "	1	26	06
5,000 to 6,000 "	1	45	25
6,000 to 7,000 "	1	49	15
7,000 to 7,706 "	1	14	15
Total......	9	24	45

The whole time taken by the plummet in descending to this amazing depth of 7,906 fathoms, or 7.7 geographical miles of 60 to a degree, was 9 hours 24 minutes and 45 seconds. The highest summits of the Himalaya are little more than 28,000 feet, or 4.7 geographical miles above the sea.

Gold weighed in the Bank of England by Machinery.—One of the most interesting and astonishing departments within the whole compass of the Bank of England is the weighing department, in which, with the rapidity of thought, and a precision approaching to the hundredth part of a grain, the weight of the gold coin is determined. There are six weighing machines, and three weighers to attend to them. Large rolls of sovereigns, or half sovereigns, are placed in grooves, and are shaken one at a time by the motion of the machine, into the scale. If they are of standard weight, they are thrown by the same mechanical intelligence into a box at the right hand side of the person who watches the operation; if they have lost the hundredth part of a grain, they are cast into a box on the left. Those which stand the test, are put into bags of 1000 each, and those below par are cut by a machine, and sent back to the mint.

New Compound of Caoutchouc.—Mr. Goodyear, of New York, has just patented a new compound of caoutchouc, which is produced by combining therewith a product of coal-tar and sulphur, alone or in combination with metals and other substances used in manufacturing compounds of caoutchouc. The product referred to is obtained by heating coal-tar in an open boiler until it acquires a consistency about equal to that of resin, and it is mixed with the caoutchouc in proportions which may vary according to the character of the material to be produced. The sulphur, or compound thereof, is used for the purpose of vulcanizing the material, which operation is performed by the application of heat in the ordinary manner.

Notice to Correspondents.

We have given the description of a New Astronomical Instrument by R. S. of Aylmer, Canada East, our best attention. We cannot recommend the construction of the Instrument for reasons advanced by R. S. himself, and which are contained in the subjoined extract from his communication:—"I am fully convinced in my own mind that this instrument will answer every purpose that I have mentioned; whether upon trial it will be *useful* or otherwise, of course remains a *mystery*."

THE CANADIAN JOURNAL,

A REPERTORY OF

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AND A RECORD OF THE

PROCEEDINGS OF THE CANADIAN INSTITUTE.

TORONTO, UPPER CANADA, JULY, 1853.

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The Canadian Journal.

TORONTO, JULY, 1853.

Irish Industrial Exhibition.

In the June number of the Journal we introduced a description of the Inauguration of Ireland's first Great Exhibition of the productions of her own and other nations' Industry. We now give a series of extracts from the *London Illustrated News*, descriptive of the most important Irish natural and artificial productions.

RAW MATERIALS.—I. TURF OR PEAT.

Among the many raw materials that conduce to the happiness of the human family, fuel fills, perhaps, the most important place. Turf is generally considered as particularly characteristic of Ireland, where it occupies the same position in social economy that coal fills with us. But, even independently of the various uses to which it can be applied, the large area it occupies is alone sufficient to claim more than ordinary attention. The entire surface covered by bog is estimated at 2,830,000 acres, which is nearly one-seventh of the whole of Ireland. Of this quantity, 1,576,000 acres are flat bog, spread over the central portions of the great limestone plain; and the remaining 1,254,000 acres are mountain bog, chiefly scattered over the hilly portions of the country near the coast. As compared to the other mineral substances, (among which turf may be classed), it is of a comparatively modern date. All bogs also abound in timber—principally oak, yew, pine and birch. The oak is generally as black and hard as ebony, whilst the colour of the yew is but slightly changed, to a rich brown or chocolate color. Both the oak and yew are found nearer the bottom of the bog than the pine and birch, and mostly in a position to show that the tree had been upright, even after the formation of the bog had made some progress.

As the bogs vary in depth, position, and appearance, so, too, the turf differs in its characteristics. Some turf is almost as black and hard as coal; whilst in bogs almost in the same locality the turf is soft, and formed of fibrous substances scarcely half decayed. But the chemical constituents differ still more widely, and often, too, in the same bog. Of this an example is given in the "Industrial Resources of Ireland." A section of the bog of Timahoe, forty feet deep, was tested, and the amount of ash it contained was found to vary. The portions near the surface contained $1\frac{1}{2}$ per cent of ashes; the central portions $3\frac{1}{4}$ per cent; whilst the lowest ten feet contained 19 per cent of ashes. Further experiments show that the turf which is found at a depth of forty feet or more, and consequently subjected to a very great pressure, approximates very closely to coal in its composition, as well as density and color; and, accordingly, we are justified in concluding that turf might be artificially made to undergo this change.

The first difficulty which must be surmounted, before turf can become as useful as coal, is to decrease its bulk; but there is another great difficulty to be overcome. Turf, from its porous nature, retains a large quantity of water. Ordinary turf retains a fourth of its weight; and turf, carefully dried under cover, still retains a tenth; and this is a serious disadvantage, not only because it adds to the weight and bulk of the turf by the addition of a useless ingredient, but because the presence of water robs the

furnace of an amount of heat (in order to expel it in the form of vapor) which would otherwise have been profitably employed.

The most natural method of condensing turf, was the application of great pressure by means of a powerful hydraulic engine. By this means turf was not only compressed into a smaller bulk, but the water it contained was forcibly expelled. Two difficulties, however, were soon found to exist—both arising from the elasticity of the fibres in the turf—an immense power was required, and the fibres gradually expanding, attracted damp from the atmosphere.

To get rid of the difficulties that arose from the elasticity of the fibres, it was proposed to place the turf mould, as raised from the bog, in large tanks, and to have it trodden by cattle, or kept in agitation by machinery, whilst a stream of water flowed through. By this process, the light and fibrous portions were easily separated from the denser, and the latter being permitted to fall to the bottom of the tank in a sediment, was easily dried when the water was shut off. The artificial coal made by this process is hard and heavy, and possesses almost all the valuable qualities of coal.

Nor are the fibrous portions of the turf mere waste. They are at present extensively used at the paper-mills, in the manufacture of the coarser sorts of card-board, known as mill-board, and of which the covers of books, &c., are made, and generally in the manufacture of all the coarser articles made of papier mache. Many specimens of these will be found in the Exhibition.

THE DESTRUCTIVE DISTILLATION OF PEAT.

Turf occupies an intermediate position between wood and coal, the different varieties of turf approaching more or less near to each; and, as both coal and wood have long been used in various processes, it is not surprising that many similar experiments should have been made with turf. The destructive distillation of wood is carried on upon an extensive scale in many localities, both in England and Ireland, and forms an important branch of industry. Its principal products are wood-vinegar, pyroligneous acid, creosote, naphtha, and charcoal. Our readers are still more familiar with the distillation of coal, which is principally conducted upon a large scale for obtaining gas for illumination, but the manufacture of which has incidentally led to the production of several other substances, including coal-naphtha, sal-ammoniac, lamp-black, &c. As both these manufactures have long existed as important branches of industry, it is surprising that more enterprising efforts were not made long since with peat, which occupied the intermediate place between the two. As it would be impossible to review the various processes, we shall rest satisfied with a glance at the experiments made by Mr. Reece, at Newtown Crommelin.

In the year 1849, Mr. Reece having brought his experiments to a satisfactory conclusion, obtained a patent for his invention of the process of distilling peat in an air blast, and thereby obtaining certain products. As the matter was one of considerable interest, and of vast importance to Ireland, his process was made the subject of scientific inquiry at the Museum of Irish Industry, and an elaborate report upon it was published. Mr. Reece proposed, instead of putting the turf into a closed vessel or retort, and distilling it as coal is distilled, by the application of external heat, to make the heat generated by its own combustion the agent in its distillation. The turf being placed in an iron cylinder, and the lower portion ignited, the heat so produced acts as the heat of an external fire would have done upon the peat lying immediately above. Thus in the upper part of the furnace, there is a simple distillation and a coking of the peat; whilst, in the lower portion, the combustion of the peat charcoal, as it descends, is

going on. This process, therefore, does not materially differ from close distillation, a saving of fuel being the chief recommendation. The principal products that result from this distillation consist of sulphate of ammonia, acetate of lime, naphtha, fixed and volatile oil, and a substance called *paraffine*, which resembles bees'-wax in its outward appearance. It is more brittle, and has a very singular smell; but it is applicable to nearly the same uses.

The Exhibition possesses specimens of turf and artificial fuel, and a collection of the principal chemical products of turf, which will not fail to interest the visitor, and perhaps cause him to reflect, as he passes over the extensive wastes of bog in the Sister Isle, upon the possible future that may yet be in store for Ireland; when science will transform these solitary morasses into mines of wealth—diffusing industry and happiness, where not long since famine and misery held undisputed sway!

II.—COAL AND ANTHRACITE.

Coal in Great Britain, fills the important position we have accorded to turf in Ireland. It possesses little beauty to attract, and derives all its value from its utility alone. It is to coal that England is principally indebted, for her commercial greatness. Without it the mighty steam-engine would be an inert mass of iron—our railroads would not exist—our steamers would not plough the deep. The principal coal-mines of England are generally well known, and specimens of their produce are to be found in most geological collections.

There are seven principal coal fields in Ireland, lying nearly equally to the north and south of the metropolis. They differ materially in their geological circumstances—those to the north of the capital, yielding bituminous, or flaming coal; and those to the south, stone coal, or anthracite, which burns without flame. Notwithstanding the abundance of turf, coal was worked in Ireland at a very early period; and pits have been discovered that bear evidence, from the rude stone and wooden tools found in them, of having been worked by a race far anterior to historical records. But, from the ignorance displayed formerly, and from present want of capital or enterprise, or something else, the produce of her mines is far less than they could yield with ease; and Ireland, that possesses sufficient resources to supply her own wants, and to become, moreover, an exporting country, imports a large quantity of coals every year, said to exceed in value a million sterling. The principal coal-mines are seven: one in Leinster, occupying large portions of Kilkenny and the Queen's County, with a small part of Carlow; two in Munster—one of them in Tipperary, bordering on that in Kilkenny—and the other spread over large portions of Clare, Limerick, Cork, and Kerry, being the most extensive coal-field in the empire. All these beds yield anthracite. Of the northern coal-fields three are in Ulster: one at Coal Island, near Dungannon; the second in the northern extremity of Antrim; and the third in Monaghan. These last are small, with narrow seams; and are, consequently, of little value. The Connaught coal-field extends over a space of sixteen miles in its greatest length, and lies in the counties of Leitrim, Roscommon, Sligo, and Cavan. The total area of these coal-fields is estimated at 140,000 acres.

It is impossible to cast the eye over some interesting maps showing the geological formation of Ireland, and exhibited by the Chairman of the Board of Works, without feeling surprise at the mineral treasures that lie neglected, scarcely below the surface of the soil on which the unemployed laborer drags his weary steps.

But it is not only in the quantity of her ores that Ireland is rich, their position is even more fortunate. No river in the empire can compare with the Shannon. Its Majestic stream winds through a course of 247 miles, through fields whose fertility cannot be excelled. Here and there it expands into lakes, or more properly into inland seas. Lough Allen, in the centre of the iron-fields, covers an area of 9000 acres, and is still very inferior in size to Lough Derg or Lough Ree. Here every opportunity is offered for inland navigation, and the cheap carriage of goods. This splendid river rises among the coal-fields of Connaught, and cuts through the centre of the Munster coal formation. But still greater advantages exist. It frequently happens that the iron ore, the limestone used in smelting it, and the coal, and if necessary, turf (for the manufacture of charcoal), all exist in close contact, divided in the centre by a river that affords at once a cheap transit and water power.

III.—IRON.

Iron was formerly worked extensively in various parts of Ireland. At that time the country was covered with timber, principally oak, and as there were few roads and no other market for the timber, it was sold for a trifling sum at the mouths of the iron mines. The abundance of timber, and its cheapness led to the establishment of a number of smelting furnaces, and a great amount of prosperity succeeded, but unfortunately, with that improvidence that appeared (we hope it no longer exists) to mar every enterprise connected with Ireland, each one felled and consumed the timber, but none planted. No one reflected that the supply of full-grown oak-trees covering the mountain could ever fail. All of a sudden the manufacturers discovered that the fuel was all gone: a consternation appeared to dull their faculties and to paralyze their energies. A feeble effort was made to supply the place of timber by coal, turf, or charcoal; but in a short time ruin succeeded the shortlived prosperity. It is now upwards of a century since the last charcoal furnace was extinguished in Kerry. Since then, the iron mines of Ireland have never filled an important position as a source of national wealth.

It will be interesting to glance at the enormous additions we receive annually to our wealth from the two minerals to which we have last alluded—iron and coal.

The quantity of iron produced in England is as follows:—

1844	1,210,000 tons.
1845	1,512,000 "
1849	2,000,000 "
1850	2,250,000 "

The quantity raised this year will, probably, exceed two million and a half tons.

In 1850, the quantity of coal raised amounted to 34,750,000 tons; and the average price of coals at the mouth of the pit in England being estimated at 5s. 7d., and that of pig iron at 48s., it will follow that we aquire an annual addition to our wealth from these sources alone, amounting to the enormous sum of upwards of fifteen millions sterling a year, viz.:—

34,750,000 tons coal at 5s. 7d. per ton	£9,710,050
2,250,000 tons pig iron at 48s. "	5,400,000

And if we were to add to this the enormous enhancement of value the iron receives by the addition of labour, the sum would almost appear fabulous. The following tables we extract from the "Industrial Resources:"—

The quantity of cast-iron worth £1 becomes worth the following sums when converted into

Ordinary machinery	£4
Larger ornamental work	45
Buckles—Berlin-work	660
Neck-chains	1386
Shirt-buttons	5896

And the quantity of bar-iron worth £1 becomes worth, when formed into

Horse-shoes	£2	10
Table-knives	36	0
Needles	71	0
Penknive-blades	657	0
Polished buckles or buttons	897	0
Balance-springs of watches	50,000	0

If, then, we were to assume a moderate sum as the average value which five millions and a half pounds' worth of iron receives by the addition of labour, we should have no difficulty in satisfying ourselves, that from this one mineral a sufficient sum is produced annually to defray the whole interest of our national debt.

IV.—COPPER.

Two-thirds of the entire copper supplied to the world is from the Cornish mines. The annual production of copper from Cornwall is 12,000 tons of metal, the value of which is £800,000 sterling. This is generally smelted at Swansea, in consequence of the absence of coals near the mines, and it being found cheaper to take the ore to the coal than the coal to the ore.

The Burra-Burra mines were discovered about the year 1845, in South Australia. Their produce between that and the year 1850 amounted to 56,428 tons of ore, the greatest part of which was smelted at Swansea. Latterly, however, arrangements have been made to smelt it upon the spot, but there can be no doubt the gold diggings have seriously injured the copper mines of Australia.

In Ireland, the principal copper mines form three groups—the first in the county of Wicklow, in the picturesque valley of Ovoca; the second in the county of Waterford, occupying the district of Knockmahon; and the third is situated in the southern portion of Cork and Kerry. The copper ore from the Irish mines is exported to Swansea or to Liverpool.

V.—LEAD.

Lead is diffused through Ireland in far greater quantity than copper. The principal mines are situated in the counties of Wicklow, Down, Armagh, Kerry, Clare, Limerick, and Cork. Small veins have been opened in almost every county in Ireland at different times, but few of them have proved very profitable. At present the principal mines are worked by the Mining Company of Ireland, and with great profit. The specimens of the different ores, and the different stages through which the products of the ore pass before they find their way into the market, are all exhibited by that company. The process of smelting the lead ore is carried on by the company at Ballycorus; and the produce of the Luganure mines in the year 1851, amounted to 674 tons, which produced 460 tons of lead, equal to nearly 69 per cent. The company state the proportions of silver in the lead ore per ton amount, from the Luganure mine, to 8 oz.; Cairne, 12 oz.; Ballyhickery, 15 oz.; Shallee, 25 oz.; Kilbricken, 120 oz.; Strayford, 10 oz. The average of silver extracted amounted, in the year 1851, to 20 oz. per ton of lead; and the total quantity to 3860 oz., producing £1029.

VI.—GOLD AND SILVER.

At the close of the last century some peasants picked up a few lumps of bright metal in the Wicklow streams. It was soon discovered that this was gold—"nuggets." The peasantry from the counties round at once flocked to the "diggings;" and all agricultural operations gave place to the gold fever. In a short space of time upwards of £10,000 worth of gold was collected by the peasantry, in pieces from the size of minute grains to lumps weighing twenty-one ounces. The rumours of the mineral wealth of the district, and the demoralisation that was the natural result of this gold-hunting, soon induced the Government to take the mining into their own hands. But, whether the result of accident, mismanagement, or fraud, the project, as a monetary speculation, was a total failure. In the course of the two years the Government managed the undertaking, no more than 945 ounces of gold were collected, the value of which was only £3675, and much under the expenses of the establishment. The Government consequently abandoned the mines, which were afterwards leased to a London company, in whose hands they proved equally unproductive. They are now abandoned. It is probable that the quantity of gold found at first in the Wicklow rivers was the accumulation of ages, during which mountains may have been worn away and carried by the streams to the sea; whilst the gold, from its weight, remained behind, constantly accumulating. No veins of gold have ever been discovered, or any traces of it, except in the alluvial deposits of the river.

Silver has sometimes been found in small quantities, in a native or pure state. The quantities found have never been of sufficient value to make the working for it a profitable speculation. The silver produced in Ireland is generally found in connection with lead. The ore of some veins is so rich in silver as to be called silver-lead. Formerly the process of extracting it was wholly unknown in Ireland, and the lead, richest in silver, used to be sold in the English market, in consequence of its brittleness, at inferior price. The silver is now separated from the lead at the Irish mines, and a fine mass of silver exhibited by the Mining Company, in a single block, worth £200, attests its practical application. By this process silver, amounting to only three ounces in the ton of lead, and worth no more than 15s., may be separated with profit.

OTHER MINERAL PRODUCTS OF IRELAND.

The other mineral products of Ireland consist of nickel and manganese, in small quantities, alums in Clare and Kerry, pipe-clays and china clays. minerals of barytes and of magnesia, ochre, slates, and marbles, and some others.

It will be necessary to consider these, and, indeed, all the raw materials of which we have made mention, when we come to treat of the various manufactures, both native, British, and foreign, that adorn the Exhibition.

In the order we have preserved, we were anxious, as far as possible, to consider the metal as it leaves the miner's hands, without any consideration to the subsequent processes it may have to undergo; and, with respect to Ireland, we were anxious to put before the reader a succinct view of her natural resources almost without commentary.

It is impossible to view all these elements of national aggrandisement and wealth, without feeling that if Ireland had ever had the good fortune of possessing as many Dargans as she has had Smith O'Briens, O'Connells, and Meaghers, smiling plenty would long since have dispossessed her poverty; and that island, so long a difficulty to all governments, and a help to none, would have been our support and our pride.

THE IRISH MARBLE COURT.

At the northern side of the Great Hall is a small compartment of great interest. It contains not only a fine collection of specimens, but several larger manufactured articles, such as chimney-pieces, &c. The principal collection of specimens consists of a series of two hundred and forty-five, representing the natural rocks, minerals, soils, &c., of Dublin, collected by Henry O'Hara, Esq., C.E. A fine collection of Irish marbles, in a glass case, exhibited by the Museum of Irish Industry; some specimens of

porphyry, from Lambay Island, and red conglomerate, from the same place, both the property of Lord Talbot de Malahide; a handsome doorway of Cork marble, two chimney-pieces, some pedestals, busts, panels, and slabs of various sizes, illustrate the marbles of the different counties in Ireland.

The marbles of Connemara are well represented. They consist of three kinds—the hard white, the black, and the green. The green varies very much in colour: sometimes it is almost white; again, pale yellow; at other times, bright yellow, or dark green, almost black. The most valuable specimens are generally of a bright green, almost as bright in its colour as malachite. We are convinced, if this marble existed only in the ruins of some Italian temple, it would not be less valued than the celebrated Verd-antique, than which it is not inferior in beauty. This marble exists in abundance in the Connemara mountains, near Ballynahinch and Clifden; and it works very well, and will bear turning in the lathe: it is, consequently, applied to many purposes. Two very handsome tables of Connemara marble—the slabs of green, and the pedestals of black—attest the size and perfection in which slabs may be procured. These tables will be found in the compartment we have alluded to. They are exhibited by Mr. Lambert, of Cong Abbey.

Black marbles exist in great abundance, but not in great purity, in Ireland. The most important quarries are those of Kilkenny and Galway. The Kilkenny marble when cut is perfectly black; but after a short time the whole surface, in consequence of the action of the light and atmosphere, becomes studded with the shells and organic remnants of the fossil insects imbedded in its substance. These are varied, and as curious as interesting, and in the eyes of a geologist would, probably, add much to the value of the marble. This Galway marble is exported in large quantities to New York and London. Black marbles are also found at Churchtown and Douraile, in the county of Cork; and in several portions of the counties of Limerick, Kerry, Clare, and Tipperary.

The Armagh and Churchtown marbles are also well represented. They present a mottled surface of red, brown, and yellow, sometimes tinted with purple. They take a high polish, and are much admired. A handsome doorway, completely made of these marbles, and two mantel-pieces, will not fail to impress the visitor with admiration for this very beautiful variety of native marble.

The other marbles of Ireland are—the ash grey, with a very fine grain, in the counties of Cork and Limerick; near Shannon Harbour, fine sienna and dove-coloured marble; near Dunkerron, county of Kerry, in small quantities, a purple marble, veined with dark green, and resembling bloodstone. In addition to these marbles, which generally are mentioned as specimens of great and inexhaustible quarries, Ireland possesses a number of veins of very beautiful marbles, and porphyries, and agates, amethysts, &c., a collection of the latter being exhibited by the Lord Chancellor of Ireland. The famous Irish diamonds, or crystals, also abound in various parts of the country, and they are now extensively used to ornament the bracelets, brooches, &c., manufactured of the bog-oak.

In the Irish marbles the articles exhibited, with few exceptions, are either contributed from the Dublin Society, or the Museum of Irish Industry—both institutions wholly or in part supported by Government grants. We see also here and there a table (and some of them very beautiful) inlaid with native marbles and other articles, showing great ingenuity; but we fail to find extensive manufactories where Irish marbles are produced, not as curiosities, but to meet a fair demand in the home or English market. A visit to the principal marble yards in Dublin will surprise us still more; for here we find the artist (in a country abounding in the beautiful marbles to which we have endeavoured to direct the attention of our manufacturers) engaged in working those imported from England, Scotland, and Italy. The inferior mantel-pieces, &c., are generally of Irish marbles; but those upon which the artist lavishes all his art are for the most part of foreign materials, often very inferior to those that abound close at hand.

We sincerely trust the display of specimens from native quarries will lead to the formation, among a few spirited capitalists, of a company like the Serpentine Company, determined to force a thriving trade in Irish manufactured marble by the only practicable means—excellence in the material, cheapness in the production, and skill and elegance in the execution.

FLAX AND ITS PRODUCTS.

Ireland is peculiarly suited for the growth of flax. The light and fertile soil, the softness of the climate, and the fresh breezes of the Atlantic that fan the island, tempering the heat of the summer sun, all conduce to the health and perfection of that delicate plant. It will be interesting, before we enter into an account of the manufacture of flax, to notice briefly the progress of the growth of the raw material.

The Royal Flax Improvement Society was organised in 1841, at which period the Irish flax crop averaged about 80,000 acres annually. In two years afterwards (1843), it had increased to 112,000; and in 1844, to 122,000. Owing to the great scarcity of seed, some unprincipled merchants passed off a large quantity of spurious seed upon the growers. This seed was several years old, and, to give it the appearance of being new, had been mixed, over a fire, in pans, with some deleterious ingredients, to give it a fresh, glazed appearance—just as the Chinese glaze their green tea. This, of course, rendered it completely valueless, and the farmers suffered heavily; but the Society, having wisely prosecuted the guilty parties, obtained heavy damages against them. Nevertheless, it produced so much disappointment and loss (and in some cases insolvency), that, in the following year, the breadth sown decreased to 96,000 acres. The crop of 1846 was one of the worst that had ever been known in Ireland or on the Continent. The result of both these causes combined was, that in 1847, the sowing fell to 48,000 acres; and, in consequence of the general distressed state of the trade and commercial panic, in which the linen trade participated, prices fell so much, that farmers were discouraged, and only 53,000 acres of flax were sown in 1848. As trade recovered from its depression, prices improved, and the breadth of the flax sown in 1849 had increased to 60,000. In 1850 it amounted to 70,000, and would have far exceeded that, had seed been procurable—every available bushel having been sown; and the quantity of flax grown last year is estimated at not less than 130,000 acres. Of this, no more than 12,000 acres were grown in the provinces of Leinster, Munster, and Connaught, and the remainder in the northern province of Ulster.

The importance of this branch of national industry will be at once seen. The value of Irish flax has generally ranged from £35 to £80 per ton, according to the quality, season, demand, &c. This had been the general average for the last 15 years; but sometimes the prices have ranged so high as £120, and even, upon one occasion, £180 per ton. The importation from abroad amounted to:—

Years.	Tons.
1840	62,649
1841	67,368
1842	55,713
1849	90,340
1850	91,097

It would be difficult to come to any conclusion as to whether Ireland will soon be able to supply all the raw flax to the manu

facturer, or whether she must still be dependant upon the Continent. The fact is, whilst the produce of Ireland has increased very much, the home demand has increased so much more, that, though Ireland has multiplied her produce nearly threefold, the importations from abroad have nearly doubled. We do not know on which to bestow most praise—on the landowner, who trebles his produce; or on the manufacturer, who so far outstrips the farmer, as still to require adventitious supplies, and hold out to the farmer an ever improving market.

Linen forms the most characteristic portion of the Exhibition, not only from the quality and quantity of the goods displayed, but because it affords an example of the capabilities of Irishmen, when they bring enterprise and perseverance to the task, to introduce into Ireland a great branch of industry, second to few in the empire in importance, and perhaps destined to rival our own cotton fabrics. The manufacture of linen is almost altogether confined to the north. There are a few factories in Drogheda in which about a thousand hands are employed; but the principal trade is carried on in Belfast, Lurgan, Donaghadee, &c. In Mr. Mulholland's factory, which we had the pleasure of inspecting a short time ago, there were between 800 and 1000 people at work; their cleanliness and moral superiority contrasting favorably with the lounging and listless peasantry of the south and west, we had visited a short time before. In the north, education, respect for the laws, and sturdy honesty are the rule.

Turning from the representation of the raw materials to those in a manufactured state, we have but little to greet the eye with an attractive welcome, and that little, for the most part, so ill-arranged, that it can only be seen at a disadvantage. It seems almost incredible—yet, nevertheless, it is a positive fact—that the only article in which Ireland, cuts a respectable manufacturing figure is thrust in the background, as though it were necessary to conceal it from public inspection. Instead of linens occupying a prominent position in the Exhibition, they are poked into lateral avenues and into dark recesses, which require a more than common amount of research to find them out. This singular arrangement is *more Hibernico*, in every sense of the term, and must speak for itself.

THE LINEN MANUFACTURES OF IRELAND.

We have already endeavored to date the time when the manufacture of flax became an important branch of industry; but it would be much more difficult to discover the origin of the manufacture of linen. We hear of it in the earliest accounts of Ireland extant. The principal garment worn by the ancient chieftains was a shirt made of from 20 to 30 yards of linen cloth, and sumptuary laws were even passed to set limits to the quantity which ostentation would have used. We find linen also frequently mentioned among the produce of Ireland; and Hakluyt, an ancient rhyme-writer, in the year 1430, states, that "Ireland's commodities be hides and fish, as salmon, herring or hake, wool, *linen*, cloth, and the skins of wild beasts." The cloth was probably the ancient Irish freize—of which presently.

The linen manufacture, until a few years since, was altogether confined to the cottages of the peasantry, where the peasant, in the intervals of agricultural labour, wove by the hand-loom, the yarn spun by the hands of the female and younger members of his family. No great factories existed at that time, nor in fact, until the discovery of spinning the thread by the wet spinning process, could factories have been established on their present extensive scale. About the year 1825, the system known as "wet spinning" was discovered in Manchester; the process consisted in passing the fibre through hot water whilst it was being twisted. Improvements were gradually made, and the English and Scotch factories soon began to undersell the handspun yarns in the Irish markets. It became necessary, to enable the Irish to compete successfully, to introduce this mode of manufacture; and about the year 1828, the first great spinning factory upon this system was erected at Belfast. Others followed the same example, and in 1841 there were no less than 41 mills, containing 280,000 spindles, at work in the North. In 1850, the number had increased to 73 mills, with 339,000 spindles; and in 1852, there were not less than 81 mills, having about 500,000 spindles, and representing a capital estimated at between three and four millions sterling, whilst upwards of £1,200,000 is annually paid in wages.

A large portion of the Southern Hall is dedicated to the exhibition of linen. Almost all the most eminent houses in the North have contributed some of their choicest specimens. These consist of damask table-cloths of a beauty and finish which have made them objects eagerly sought for by more than one Sovereign; of cambrics, single and double damask napkins, sheeting, quilts, muslins, and a variety of other articles.

SEWED MUSLIN.

Sewed muslin, or muslin embroidered with the needle, is an interesting branch of Irish manufacture; the extent of which is not sufficiently known, nor its value, as a branch of domestic industry, enough appreciated.

Although the sewed muslin trade is carefully fostered in the south and west of the island, yet we must not conclude that for that reason it is not capable of flourishing without artificial aid. In the north it receives none: it is self-supporting in the widest sense of the word. The principal warehouses belong to Scotch manufacturers; and the works are executed generally for Scotch houses. For one article made to gratify the luxury of the great a hundred are made for the use of the million; and, in addition to this, a demand from America is daily increasing, and the trade bears all the symptoms of one with which machinery can never interfere, nor the caprice of fashionable society; but one founded on the requirements of the people, and likely to increase with the comfort and growing prosperity of the middle classes.

IRISH POPLINS AND TABINETS.

The manufacture of tabinets is almost the only one of which the Irish metropolis can now boast. There are, of course, several other branches of manufacture, but they appear to exist almost by sufferance. But that of which we are now treating has taken a healthy root.

The first object of skill that presents itself is the manufacture of poplins, which may be termed a native industry. Three Jacquard looms exhibit, in their several forms, the peculiarity of the manufacture of figured poplins; and the cases immediately adjacent contain some excellent specimens of the plain-work in their several widths and qualities. There is no great consumption, however, for this article, although it is never out of date—being considered, nearly throughout Europe, a kind of bread-and-cheese article, which can be adopted whenever the presentations of fashion happen to pall upon the taste. The principal consumption of poplins is in England; the least, perhaps, in Ireland itself. Since the application of this article to paletots the manufacture has slightly enlarged; but, as that is merely a temporary demand, the ordinary production must soon resume its level. The Messrs. Fry, perhaps, occupy the highest ground in this branch of industry, and exhibit a Jacquard-loom weaving a single-coloured, but beautifully figured, poplin, which they designate the Dargan Robe, in compliment to the lady of the spirited projector of the Exhibition, at whose order it is manufactured.

WOOLLENS.

Upon minute examination, it will be found that the woollen manufacture of Ireland, as a whole, is at a low ebb, and—with one or two exceptions—much inferior to those of England and the Continent. It was proved at the Exhibition of 1851, that the fine woollen cloths of France were, in a few instances, suuperior to our own; but, taking the general run of goods, we had no superior, and scarcely an equal. Ireland, on the contrary, ranks nearly in the lowest scale of European woollen-manufactures; and with the exception of her friezes and elbinas, the productions of her looms are scarcely entitled to the appellation of a manufacture. The two exceptional kinds of cloth, however, just mentioned, she manufactures of a good quality, and turns them out in a very marketable condition. There is, also, a peculiar character about the finer kinds of friezes and elbinas, which few of our English woollen fabrics can lay claim to; they are honestly put together, contain a true quality of the raw material, and in the wear maintain their beauty much longer than similar goods imitated in England and elsewhere. The same remark may be applied to her blankets, for which Ireland is entitled to great credit; they are generally finer in the texture than those of England, are much warmer, and will wear longer, although a little higher in price. One, if not the main, cause of the superiority of the Irish blankets, arises from the wool being less carded than that of the English make, and, as a consequence, its wiry elasticity and its cohesive attraction are more effectually preserved. Ireland, also, turns out some decent qualities of tweeds; but she has little chance of competing with Scotland in the manufacture of that article.

The frieze is the most ancient Irish woollen manufauture we read of. It is mentioned in several old Acts of Parliament; and, so early as the year 1382, it is stated that among the articles sent to the Pope from Ireland were five mantles of cloth, one lined with green, and one russet garment lined with Irish cloth.

The principal woollen cloths at present manufactured in Ireland consist of blankets, which are manufactured in several parts of the island, but principally in Kilkenny; flannels, drugget-cloth, hosiery, tweeds, elbinas, and friezes. Some of these, particularly the last two, reflect much credit on the exhibitors.

LACE.

The manufacture of lace in Ireland was introduced, we believe, by Mr. C. Walker, of Limerick, in 1829, and the firm of which he was then a member, employ at the present time upwards of 600 hands at that work. Preceding that period the manufacture of lace, of the character which we are about to describe, was principally confined to the Continent, as neither the Buckinghamshire nor Northamptonshire pillow lace could be compared to it in quality. France and Belgium had almost the exclusive supply of the finer kinds of thread-lace to this country, antecedent to its manufacture in Ireland; and the very names of Vallenciennes, and Brussels, are "familiar as household words" amongst the consumers of that delicate article, and still characterise a certain quality of it, wherever it may be manufactured. But Ireland has stepped beyond both these countries, and now makes a quality of lace of different kinds, which would find a ready sale in the French markets, were there no prohibitory duties to prevent it. The appliqué, the guipure, the tambour, and, above all, the beautiful Italian point, are all produced in Ireland, and are highly creditable to her industrial skill and energy. The export to England is considerable, and forms one of the most beautiful articles of female attire that we can boast of, when comparing our productions with those of foreigners.

MUSICAL INSTRUMENTS.

It must be confessed that Ireland throughout all her troubles and with all her shortcomings of industry, has preserved a nice appreciation of art. Whatever may be her delinquencies in other respects, she pays great homage to the beautiful and intellectual whether it be embodied in painting, in sculpture, or in music; and no greater proof can be adduced of the warm sympathies and mercurial feelings of the Irish character than the crowds which linger in the picture gallery, and gather round the several pieces of statuary. Nor is music less admired among our lively neighbours; for Dublin, we believe, is one of the most musical cities of Europe, although she may not indulge in so many public concerts as her more affluent contemporaries. The truth is, that music is cultivated in private life to a great extent in Dublin and other places in Ireland; and it is this kind of cultivation, more than public concerts, that stamps the musical character of a people. That this is the case in Dublin, there can be little doubt for it is a well established fact that instruments of the most expensive kind find a sale there, and that large numbers of moderate-priced ones are annually disposed of. Upwards of one thousand pianofortes are imported from the great London manufacturers every year; and that number is exclusive of other kinds of musical instruments, for which there is a considerable demand.

The display of musical instruments in the Exhibition is, therefore, somewhat imposing; and deserves a more extended notice than our space permits.

Some Remarks on the Probable Present Condition of the Planets Jupiter and Saturn, in reference to Temperature, &c. By James Nasmyth.

Read at the Meeting of the Royal Astronomical Society.

The remarkable appearances which characterise the aspect of the planets *Jupiter* and *Saturn*, as revealed by the aid of very powerful and excellent telescopes, have induced some reflections on the subject of their probable present condition as to temperature. With a view to elicit more special and careful observation of the phenomenon in question, and promote discussion on this interesting subject, I have been tempted to hazard the following remarks, which may perhaps prove acceptable to some of the members of the Royal Astronomical Society.

"In a former communication, in reference to the structure and condition of the lunar surface, I made some remarks on the principle, which, as it appears to me, gives the law to the comparative rate of cooling of the planets: namely, that while the heat retaining quality was due to the mass of the planet, the heat-dispensing property was governed by its surface; and as the former increases as the *cube* of the diameter of the planet, while the latter increases only as the *square* of its diameter, we thus find that the length of time which would be required by such enormous planets as *Jupiter* and *Saturn* to cool down from their original molten and incandescent condition to such a temperature as would be fitted to permit their oceanic matter to permanently descend and rest upon their surface, would be vastly longer than in the case of such a comparatively small planet as the earth.

"Adopting the results which geological research has so clearly established as the original molten condition of the earth, as our guide to a knowledge of the condition of all the other planets, it appears that we may in this way be led to some very remarkable and interesting conclusions in reference to the probable present condition of such enormous planets as *Jupiter* and *Saturn*, tending to explain certain phenomena in respect to their aspect.

" Assuming as established the original molten condition of the earth, and going very far back into the remote and primitive periods of the earth's geological history, we may find glimpses of the cause of those tremendous deluges, of which geological phenomena afford such striking evidence,* and by whose peculiar dissolving and disintegrating action of the igneous formations which at that early period of the earth's history must have formed the only material of its crust, we may in that respect obtain some insight into the source whence the material which formed the first sedimentary strata was derived. If we only carry our minds back to that early period of the earth's geological history, when the temperature of its surface was so high as that no water in its *liquid* form could rest upon it, and follow its condition from such non-oceanic state to that period at which, by reason of the comparatively cooled-down condition of its surface, it began to be visited by partial and transient descents of the ocean, which had till then existed only in the form of a vast vapor envelope to the earth, we shall find in such considerations, not only the most sublime subject of reflection in reference to the primitive condition of our globe, but also, as it appears to me, a very legitimate basis on which to rest our speculations in regard to the probable present condition of *Jupiter* and *Saturn*,—both of which great planets, I strongly incline to consider for the reasons before stated, are yet in so hot a condition, as not only not to permit of the permanent descent of the oceanic matter, but to cause such to exist suspended as a vast vapor envelope, subject to incessant disturbances by reason of the abortive attempts which such vapor envelope may make in temporary and partial descents upon the hissing-hot surface of the planet.

" Recurring again to this early period of the earth's geological history, when it was surrounded with a vast envelope of vapor, consisting of all the water which now forms the ocean. The exterior portion of this vapor envelope must, by reason of the radiation of its heat into space, have been continually descending in the form of deluges of hot water upon the red hot surface of the earth. Such an action as this must have produced atmospheric commotions of the most fearful character; and towards the latter days of this state of things, when considerable portions of what was afterwards to form our ocean came down in torrents of water upon the then thin solid crust of the earth, the sudden contraction which such transient visits of the ocean must have produced on the crust of the earth would be followed by tremendous contortions of its surface, and belchings forth of the yet molten matter from beneath, such as yield legitimate material for the imagination, and the most sublime subject for reflection. The extraordinary contortions and confusion which characterize the more primitive sedimentary strata, such as the gneiss, schist, and mica slate, in so very remarkable a degree, shadow forth the state of things, which must have existed during that period, when the ocean held a very disputed residence on the surface of the earth.

" Could the earth have been viewed at this era of its geological history from such a distance as the planet *Mars*, I doubt not it would have yielded an aspect in no respect very dissimilar to that which we now observe in the case of *Jupiter:* namely, that while the actual body of the earth would have been hid by the vast vapor envelope then surrounding it, the tremendous convulsions going on within this veil would have been indicated by streaks and disruptions on the surface, which would be mottled over with markings such as we observe in the case of the entire surface of *Jupiter:* and by reason of the belchings forth of the monstrous volcanoes which at that period must have been so tremendously active on the earth, the vapor envelope would be most probably marked here and there with just such dingy and black-and white patches, as form such remarkable features about the equatorial region of *Jupiter*—probably the result of volcanic matter, such as ashes, &c.,—which the volcanoes about his equator may from time to time vomit forth, and send so far up into the cloudy atmosphere as to appear on the exterior, and so cause those remarkable features which so often manifest themselves on the outward surface of his vapor envelope; for I doubt if we have ever yet seen the body of *Jupiter*, which will probably remain veiled from mortal eyes for countless ages to come, or until he be so cooled down as to permit of a permanent descent on his surface, of his ocean, that is to be.

" In applying these views to *Saturn*, it occurs to me that we obtain some glimpses into the nature of those causes which have induced, and are now apparently inducing, those changes in respect to the aspect of his rings, which have more especially of late, attracted so much attention. If *Saturn* also be so hot, that his future ocean is suspended as a vast vapor envelope around him, it is possible I conceive, that some portion of this vapor may migrate, by reason of the peculiar electrical conditions which it is probable his rings may be in, in respect to the body of the planet: and that such migration of vapor in an intensely frozen state, as it must be in such situation, may not only appear from time to time, as the present *phantom ring* does, but also does incrust the inner portion of the interior old ring with such vast coatings of hoar-frost as to cause the remarkable *whiteness* which so peculiarly distinguishes that portion of his rings. In fact, such are the extraordinary phenomena presented by this planet, that one is led to hazard a conjecture or two on the subject; and, I trust such as I have now the pleasure to offer, may meet with a kind reception from the Royal Astronomical Society.

* The deluges here alluded to are quite distinct from those which have so frequently during various periods of the Earth's Geological History, swept over vast portions of its surface, and of whose tremendous violence we have such clear evidence, in the denudation of the hardest rocks, the debris of which has yielded the material of nearly every sedimentary formation, from the period of the old red sand stone formation upwards.

These vast and often repeated deluges I consider to have resulted from mighty incursions of the ocean over vast portions of the earth's surface, which till then were dry land. The retreat of the matter below the earth's surface, resulting from the progressive contraction, consequent on its gradual cooling, must have again and again permitted extensive portions of the solid crust of the earth to suddenly crush down, like an over-loaded ill-supported floor, and so allowed the ocean to rush in with fearful violence, and to occupy the place of the so submerged continent.

Judging from the facts which Geological Phenomena yield us in abundance, these incursions of the ocean must have been sudden, violent, and of frequent occurrence.

The sudden sinking down of a continent to the extent of 1000 feet in depth, would be but an insignificant adjustment of the crust of the earth to the retreating or contracting interior, as compared to its actual diameter (being only about one forty thousandth part), but yet such a subsidence occurring to any portion of a continent near the sea, would occasion a rush of waters over its surface, amply sufficient to perform all the feats of violence and denudation which have taken place during many successive periods of the earth's Geological History, and of the occurrence and action of which we have most palpable evidence, not only in the vast accumulations of debris, caused by these violent incursions of the ocean, but also in the prodigious dislocations of strata, which have resulted from the crushing down of the crust of the earth, in its attempts to follow down and fill up the void or hollow spaces caused by the contracting and retreating Nucleus, which, as before said, I consider to be the true cause of this class of deluges, the tremendous violence of which has yielded the old red sandstone; and all other sandstones, conglomerates, boulders, gravel, sand, and clay.

On Ericsson's Hot Air, or Caloric Engine; by William A. Norton, Professor of Civil Engineering in Yale College.*

(Continued from Page 249.)

PERFORMANCE.

There have been two trial trips of the Ericsson, in the New York harbor and bay, and the ship has subsequently made a successful trip to Alexandria and back. On the first occasion only the inventor, owners and crew were present. The performance on the occasion of the second trip (Jan. 11th, 1853) was witnessed by the members of the New York press, and a few other gentlemen, present by invitation. The results of the trip have been published in all the New York papers, but the different

* *Sill. Jour.*

accounts disagree very materially on most of the important points. By personal inquiry and by consulting the most reliable accounts I have endeavoured to come as near to the truth as possible. The following are the principal results:

No. of revolutions of wheels per minute, (according to Ericsson,)	$9\frac{1}{4}$
Same, (according to other most reliable authorities,)	9
Speed through the water, (according to Ericsson.)	$8\frac{1}{2}$ miles.
" " (according to other authorities,)	7 "
Working pressure in receiver, per square inch	8 lbs.
Consumption of anthracite coal in 24 hours	6 tons.

The two estimates of the speed through the water are quite different, but the number of revolutions of the paddle wheels as stated by different authorities, lies between 9 and $9\frac{1}{4}$. The number of revolutions, about which there is but little disagreement, will enable us to obtain by calculation a pretty close approximation to the speed. For this purpose we have the following data. Diameter of the wheels from centre of pressure to centre of pressure, $30\frac{3}{4}$ feet; paddles 32 in number, on each wheel, and $10\frac{1}{2}$ feet long by 16 inches deep; dip of the wheels 44 inches. The following quantities were obtained by calculation, viz.: number of paddles in water on each wheel, 7; immersed paddle surface on both wheels, 196 square feet; area of midship section, at 17 feet draft, 520 square feet; ratio of immersed paddle surface to area of midship section, 1 to 2.653; same for Steamship Arctic, 1 to 1·662 (see Journal of Franklin Institute for Jan. 1853, No. 1 p. 33;) slip of wheels of Arctic, 19·32 per cent. From which we find the slip of the wheels of the Ericsson, on the trial trip to have been 25·4 per cent. The distance passed over by the centre of pressure of wheels was 9·88 miles per hour. Hence allowing for the slip, the speed of the ship was 7·47 miles per hour. If we allow for the less oblique action of the paddles in the case of the Ericsson than in that of the Arctic, we find the speed to have been 7·57 miles per hour (the slip of the wheels being reduced to about 23·4 from this cause.

There is some little uncertainty with regard to the area of the midship sections Although I have not succeeded in obtaining the data necessary for an exact calculation of this element, the information furnished me in reference to the model of the Ericsson as compared with that of the steamers of the Collins' line, has enabled me to approximate very nearly to a correct result. The rule by which the calculation was made has been tested by trying it upon a large number of ships. It gives results, in almost every instance, a little too small; thus for the Arctic, the result is 662, and the true area is 685. The greater "dead-rise" of the Ericsson may diminish the area, as compared with the Arctic, some 30 square feet; which would make it about 510 square feet. It in all probability, lies between 520 and 500.

If we take it at 500, the slip of the wheels comes out 23 per cent, and the speed of the ship 7·61* miles. In view of all that has now been stated, we may conclude that *the average speed of the Ericsson through the water, on the trial trip could not have exceeded* $7\frac{3}{4}$ *statute miles per hour;* and was most probably about $7\frac{1}{2}$ miles.

Horse-power of the Ericsson's Engines, developed on the trial trip. Working pressure of air, 8 lbs.+15 lbs. Supposing the cut off to be at $\frac{15}{23}$ (=·652) of the stroke, then the mean effective pressure, in each cylinder, would be 6.4 lbs+15 lbs.; and the horse-power of both engines, calculated by the rule given on page 403, would be 311. If we take the cut off $\frac{63}{100}$, as it is stated to be in some accounts, then the mean effective pressure in the working cylinder we find to be 6.04 lbs.+15 lbs., while that in the supply cylinder remains at 6.4+15. With these data the result obtained for the horse power is 259.

For a mean effective pressure, in each cylinder, equal to 6 lbs., the result is 292; and for $6\frac{1}{2}$ lbs., it is 316.

The power developed by the engines on the trial trip, was undoubtedly less than the determination above obtained (311), for the reasons mentioned on page 270; we may safely conclude that *it could not have exceeded* 300 *horses-power*. It was probably less. This is but one half of the full power of the engines, according to Captain Ericsson's estimate. This estimate supposes a working pressure of 12 lbs., to be employed, whereas, by reason of leakage, &c., but 8 lbs could be obtained. In fact, making the calculation on the supposition of a working pressure of 12 lbs., and taking the cut off at $\frac{2}{3}$ stroke, neglecting also, the clearance, which is not known, I find the horse-power of the two engines to be 640. The allowance for clearance and other causes of reduction which have been indicated (see p. 403,) may well reduce this determination to 600.

The power, but for practical difficulties, may be indefinitely increased, by enlarging both cylinders, keeping their relative size the same.

It is stated that Captain Erricsson has fixed upon 12 lbs. as the highest limit likely to be practically reached in the working of caloric engines. This must be regarded as an indication either that it is not expected the leakage will be entirely stopped, or that it is supposed that it will not be regarded as safe and economical to work at the high temperature of 500°, and upwards, necessary to double the expansive force of the air.

Consumption of Fuel, on trial trip, 6 tons of anthracite coal per day. or 560 lbs. per hour. This amounts to 1·87 lbs. per horse-power per hour. If the full power of the engines (600) were to be developed, the expenditure would be 0·93 lbs. per horse-power per hour. On the other hand, if we allow that the excess of pressure in the receiver over that in the working cylinder, on the trial trip, was $\frac{3}{10}$ of a pound per square inch, and the excess of pressure in the supply cylinder over that in the receiver the same, we find that, with a cut off at $\frac{2}{3}$, the horse power developed could not have been more than 248. The expenditure of fuel, answering to this determination, would be 2·26 lbs. per horse-power per hour.

COMPARISON WITH THE STEAM ENGINE.

1. Comparative consumption of Fuel. This is presented in the following table.

TABLE 1.

Name of Ship	Press of steam or air.	Horse-power.	Lbs. of bit. coal.	Equiv. lbs. of anth. coal.
	lbs.			lbs.
Ericsson	6·4	300	- -	1·87
"	6·3 & 6 9	248	- -	2·26
"	10·3	600*	- -	0·93
Humboldt,	22·1	2397	2 71	2·23 to 2·37
Franklin	20·3	1732	3·55	2·48
Washington,	18·3	992	3·38	2·37
Hermann,	17·4	994	3·42	2·39
Ohio,	23·4	1732	- -	2·59
Georgia	23·4	1732	- -	2·59
Falcon	22·5	534	3.81	2·66
Fulton (the third,)	31.8	823	- -	2·77
South America.	31·8	1168	- -	2·60

The second column shows the mean effective pressure of the steam, or air, per square inch, on the piston; the third the real horse-power actually developed by the engines of each ship; the fourth the number of pounds of bituminous coal, per horse-power per hour, consumed: the fifth the equivalent amount of anthracite of coal, i. e., the number of pounds that would do the same work. These several quantities answer to the average perform-

*If we take the number of revolutions of the paddle-wheels at $9\frac{1}{4}$, the speed comes out 7.88 miles.

ance of the engines, except in the case of the South America, (a Hudson river boat,) in which they show the maximum performance. The data for the calculations were obtained for the most part from Stuart's "Naval and Mail Steamers of the United States." The mean effective pressure of the steam, for the whole stroke, has, in each instance been diminished 2 lbs. to allow for the reaction of the imperfectly condensed steam on the other side of the piston. The reductions from the fourth to the fifth column were effected, except in the case of the Humboldt, by multiplying by $\frac{7}{10}$ (nearly in accordance with the results of certain experiments and investigations made by Charles B. Stuart, Esq., Chief Engineer of the U. S. Navy. (See work just quoted, p. 183 and 186.)

The following results were obtained by diminishing the average boiler pressure 2 lbs., which is about the usual excess of the boiler over the cylinder pressure.

TABLE II.

Name of ship.	Effec. press. of steam or air.	Horse-power.	Lbs. of bit. coal	Equiv. lbs. of anth.
	lbs.		lbs.	lbs.
Ericsson, ...	6·4	300	- -	1·87
"	6·3 to 6·9	248	- -	2·26
"	10·3	600	- -	0·93
Humboldt, ...	20·5	2235	2·91	2·31 to 2·54
Franklin, ...	18·8	1607	3·82	2·67
Washington, ..	16·9	911	3·66	2·56
Hermann, ...	16·0	866	3·72	2·60
Ohio, ...	21·7	1606	- -	2·80
Georgia, ...	21·7	1606	- -	2·80
Falcon, ...	20.8	494	4·12	2·88
Mississippi ..	14·0	539	5·26	3·68
Arctic, ...	19·0	2290	- -	3·50
Fulton (the 3d.)	30·1	776	- -	2·93
South America.	30·1	1104	- -	2·75

In the two cases of the Arctic and Mississippi, the mean effective cylinder pressure was obtained by an indicator. The results, given for the other steam ships would doubtless be nearer the exact truth if an additional allowance of from 1 to 2 lbs. were made for the greater reaction of the partially condensed steam in the cylinder than in the condenser. If an allowance of 2 lbs. be made on this account, we obtain the following result.

TABLE III.

Name of ship.	Effects press. of steam.	Horse-power.	Lbs. of bit. coal.	Equiv. lbs. of anth.
	lbs.		lbs.	lbs.
Humboldt, ...	18·5	2017	3·22	2·65 to 2·82
Franklin, ...	16·8	1436	4·27	2·99
Washington, ..	15	862	4·15	2·90
Hermann, ...	14	758	4·22	2·97
Ohio, ...	19·7	1458	- -	3·08
Georgia, ...	19·7	1458	- -	3·08
Falcon, ...	18·8	446	4·56	3·18
Mississippi, ...	14·0	539	5.26	3·68
Arctic, ...	19	2290	- -	3·50
Fulton, ...	28·1	727	- -	3·13
South America,	28·1	1036	- -	2·94

The average consumption of anthracite coal by the several steam ships named in the table, is 3·11 lbs. per horse-power per hour. Dividing by 1·87 and 2·26, we obtain the quotient, 1·66 and 1·38. From which it would appear that the advantage is in favor of the caloric engine, in the proportion of 8 to 8·3, for the one estimate of the horse-power developed on the trial trip, and of 5 to 6·9 for the other estimate. If Ericsson's estimate of the power of the engines of the caloric ship should hereafter be realized, then the gain in the expenditure of fuel, would be in the ratio of 1 to 3·39. But we shall soon see, in another connection, that the comparison ought rather to be made with the numbers given in Table II. If this be done, (omitting the results obtained for the Mississippi and the Arctic, which correspond more nearly to the supposition made in Table III), we find the advantage in favor of the Ericsson, in so far as it has hitherto shown its capabilities, to be in the proportion of 5 to 7·3, or 5 to 6; that is, to be in all probability, in a ratio lying between these two limits. If we make a comparison with the Washington and the Humboldt, the highest admissible ratio is found to be $\frac{6·8}{5}$, and the lowest $\frac{5·7}{5.}$

We conclude therefore that the saving of fuel hitherto effected in comparison with the condensing steam engine, in its most economical operation, is not more than $\frac{2}{7}$,* and may be as low as $\frac{1}{8}$.

At the same time it is to be observed that if the supposed inherent capabilities of the new engine should be realized, the saving effected might amount to no less than 70 per cent.

2. *Weight of the Engine—Calculation of the Weight of the Engines of the Ericsson.*—Weight of hull, from 1200 to 1300 tons, as deduced from the weight of the hull of the Arctic; displacement, at 17 feet draft, 2200 tons, as calculated by the builders of the ship; ballast, 200 tons of pig iron; weight of masts and rigging, coal, &c., 100 tons, at the outside: hence weight of the engines and paddle wheels,=2200—1300—200—100=600 tons, or 2200—1200—200—100=700 tons.

I find that the same rule for the calculation of the displacement, from the length, breadth, and depth, which gives the displacement of the Arctic correctly, and a near approximation to that of American steamships generally, makes that of the Ericsson at 17 feet draft, about 2600 tons, which is 400 tons above the estimate made by the builders of the ship; a fact which is to be attributed, doubtless, to the peculiar model of the ship.

COMPARISON WITH WEIGHT OF STEAM ENGINE.

	Horse-power.	Weight	Rates of w't. to horse-pwr.
Mississippi, ...	539 (developed)†	494 tons.	0·91
Missouri, ...	600 (estimated)	500	0·80
Saranac, ...	605 "	367	0·61
Michigan, ...	334 "	160	0·48
Niagara, ...	1440 (developed)	150	0·10
Ericsson,‡.....	300 "	600	2·20
"	300 "	700	2·33
"	600 (estimated)	600	1·00
"	600 "	700	1·16

The numbers given in the second column include the weight of the boilers, water in boilers, coal bunkers, and all appurtenances, together with the weight of the paddle-wheels.

It appears from this comparison that, in proportion to the actual horse-power, the weight of the Ericsson's engines is about three times as great as the ordinary weight of the engines of sea steamers; and in proportion to the estimated power, more than 30 per cent. greater.

3. *Space occupied by the Engines.*—This point has been attentively considered by a correspondent of the Journal of the Franklin Institute (see the second February number of the Journal, p. 128), who shows that here also the advantage is on the

* If the comparison be made with the Ohio and Georgia, the saving may be nearly $\frac{2}{9}$.

† This shows the horse-power of the Mississippi developed in its average performance. There can be no doubt that its full power is over 600; and therefore that the ratio of the weight to the horse-power is as low as 0·82. Besides, the weight of "wheels, tools, duplicate pieces of engine, stores of the engine department, &c.," is set down at 288 tons, which is more than 100 tons above what would be deemed a sufficient allowance. Reducing the total weight to 400 tons, we have the ratio of 0·67.

‡ If we take the lowest determination of the horse-power of the Ericsson, viz: 243, the ratio of the weight to the horse-power comes out 2·82.

side of the steam engine;—the economy of space being nearly twice as great.

4. *Friction and other Resistances.*—We may obtain an estimate of the comparative resistance, in the two forms of engine, to be overcome by the moving power, by reducing the power of the steam engines to the speed and immersed midship section of the Ericsson on the occasion of the trial trip; that is, calculate what reduced power they would have if they were just capable of propelling with a speed of 7 or $7\frac{1}{2}$ miles per hour, the ships in which they are placed, if the area of the immersed midships section were the same as that of the Ericsson at 17 feet draft, i. e. 520 square feet. This may be effected by observing that the horse-power will vary nearly as the cube of the velocity multiplied into the area of the transverse midship section. This is quite near the truth, if we suppose the diminution of power to be accomplished by reducing the area of the piston, and other parts of the engine proportionally; the pressure of the steam, cut off, and all other circumstances remaining the same. The following table contains the results of a few calculations made by the rule just stated.

	Hrse-pwr.	Speed.	Area of mid. sec.	REDUCED HORSE-POWER.	
				Sp'd of 7 miles.	Sp'd of $7\frac{1}{2}$ miles.
		miles.	sq ft		
Mississippi,	539	8·4	684	224	276
Arctic,.....	2290	13·4	685	215	264
Washington,	911	11·0	608	202	247
Fulton, ...	776	13·3	281	210	259
S. America.	1104	18 (as'md)	132	257	316

These determinations, although they differ considerably among themselves, as was to be expected, from the variety of size and model of the hulls of the several vessels selected, as well as of construction and operation of the different engines, and are not to be regarded as very exact, still serve to show that no just claim can be set up of superiority on the part of the hot air engine over the steam engine, on the ground that the resistance incident to the movement of the engine is decidedly less. Also, on observing that the horses-power given in Table II. were used in making the calculations for the Washington, Fulton and South America, it will be seen that the statement just made is still true if we include among the several resistances in play in the steam engine, the excess of the reaction of the partially condensed steam in the cylinder over that of the same in the condenser. We may hence conclude that we were justified in making the statement that the comparative consumption of fuel by the two engines, in producing the same useful effect, is to be ascertained by taking the determinations of expenditure given in the last column of Table II, rather than the larger values to be found in Table III.

5. *Adaptation to the production of high velocities.*—At double the speed of the Ericsson on the trial trip, that is at 14 to 15 miles per hour, the horse-power would be about eight times greater, or about 2400; and the quantity of coal consumed, deduced from the present capabilities of the engine, would be eight times greater, or 48 tons per day. This supposes the draft to remain the same, whereas it will be materially increased by the necessary augmentation of the weight of the engines. In fact the weight of the engines at the speed supposed would be about three times as great as their present weight. At her present draft, (viz., 17 feet,) an additional weight of 200 tons would sink the hull of the Ericsson one foot. Taking the lowest estimate of the weight of the present engines, (600 tons), the necessary addition of weight would not be less than 1200 tons; which would sink the hull nearly 6 feet, or increase the draft to about 23 feet, that is, make the draft after the 200 tons ballast is removed, 22 feet; which is from 1 to 2 feet deeper than the load-line. The midship section would thereby be enlarged to 720 square feet, and therefore the power necessary for the production of the double velocity augmented in the proportion of 520 to 720. If this be done, we find the required horse-power to be 3320. The corresponding consumption of coal would be 66 tons per day. Now, even at 50 tons per day, the stock of coal required for a transatlantic voyage of 12 days duration, would not be less than 600 tons; which would produce an additional depression of the hull of nearly 3 feet, or sink it some 5 feet deeper than the load-line. If it should be maintained that the weight of the engines would not be more than doubled, the depression produced by the engines and the necessary supply of coal would still be below the load-line. Again, if it should be conjectured that the consumption of coal will not be augmented, in the case of the caloric engine, in the same proportion as the real horse-power, to show that this supposition is erroneous it is only necessary to state that, as a matter of fact, the amount of coal consumed for each horse-power by the engines of the Ericsson, is even greater than that consumed by the stationary caloric engine. Ericsson gives 60 as the horse-power of the stationary engine, and 0·6 lbs. per horse-power per hour as its consumption of fuel, and 600 and 0·9 lbs. as the corresponding quantities in the case of the Ericsson's engines.

Let us now see what will be the result in case the estimated capabilities of the caloric engine should be realized. If the horse-power should be increased from 300 to 600. the speed of the ship would be increased nearly in the proportion of the $\sqrt[3]{300}$ to the $\sqrt[3]{600}$, or of 6·69 to 8·43; that is, to 8·82 or 9·45 miles per hour, according as the speed on the trial trip is taken at 7 or at $7\frac{1}{2}$ miles. To obtain a speed of 15·5 miles, which is the speed of the Arctic in still water, the expenditure of fuel must be increased in the proportion of $(8{\cdot}82)^3$ to $(15{\cdot}5)^3$, or from 6 to 33 tons, disregarding the increase of draft. As a matter of fact the weight of the engines will be augmented in about a two-fold proportion, which will increase the draft nearly 3 feet; or make the draft, after the ballast is removed, about 19 feet, and thereby augment the necessary consumption of fuel to 38 tons. The supply of coal for a 12 days voyage, at 50 tons per day, would be 600 tons; this additional load would increase the draft on leaving port to 22 feet, which is some 2 feet deeper than the load-line.

If we take the other estimate of the velocity answering to 600 horses-power, viz., 9·45 miles, the amount of coal required, at the velocity of 15·5 miles in still water, will be about 30 tons per day, or 450 tons for a voyage of 15 days. The addition to weight of engines will not be less than 360 tons; and 360+450=810 tons will just sink the ship to the load-line.

The Arctic would accomplish the voyage in the same time, and carry not less than 700 tons freight. But in doing this her engines would consume about 600 tons more coal than those of the Ericsson in the case supposed. This estimate, of the highest possible performance of the Ericsson, is so near an approximation to the performance of the steamships of the Collins' line, that it must be admitted to be within the bounds of possibility that caloric ships may hereafter compete successfully with these celebrated steam-ships. At least this conclusion seems to follow, unless we have underrated the necessary weight of the caloric engines. It must be left to time to decide the question, whether the full estimated power of the caloric engines can be actually obtained; and whether, therefore, the results which have been indicated, will, from being a mere ideal limit, ever come to be an actual realization.

With her present capabilities the average speed of the Ericsson at sea would not exceed 6 miles per hour, (see Journal of the Franklin Institute for February, No. 2, p. 127); and she would require 24 days to perform the voyage to Liverpool (3550 statute

miles.) It seems highly probable that her speed will be increased by alterations and improvements in her machinery, but it is to be observed that when depressed to her load line, the full estimated power of her engines will propel her at no more rapid rate than $8\frac{1}{2}$ miles per hour, in still water, and less than 7 miles per hour at sea.

6. *Application to Inland Navigation, &c.*—The weight of the caloric engine, and the large amount of space which it requires, would seem to preclude all hope of applying it successfully, in its present form, to river or lake navigation, or to railroad locomotion. (See table on p. 408.) In its application to manufacturing purposes and to the drains of mines, &c., the same objections will have much less force, and a favourable result may therefore be more confidently expected. In this point of view, however, a comparison should be instituted between the caloric engine and the high pressure steam engine, working very expansively.

General Conclusions.—The more important general conclusions to which this comparison has conducted are,

1. That Ericsson's Hot Air engine, as compared with the condensing marine steam engine in its most economical operation, has shown the ability to do the same work with the use of from $\frac{1}{6}$ to $\frac{1}{5}$ less fuel; and that if its full estimated power should hereafter be developed, the saving effected would be 70 per cent.

2. That, for the same actual power, its weight is about three times as great as that of the marine steam engine, and that in case its estimated power should be obtained, its weight would be as much as 30 per cent. greater.

3. That in respect to the space occupied by the engines and coal, the advantage is decidedly in favor of the steam engine.

4. That, the great weight of the engine in proportion to the power developed, must prevent, for the present, the realization of a high speed in the propulsion of vessels. At the same time it is to be admitted that the full estimated power is adequate to the production of high velocities. Time alone can decide the question whether or not this maximum power is really obtainable.

5. The great weight of the engine, and the space occupied by it in its present form, will in all probability prevent its adoption for the purposes of inland navigation and railroad locomotion, in preference to the steam engine. If used as a land engine, these features will be less objectionable; accordingly, it is only in this form of application, and in those cases of marine navigation in which speed is likely to be sacrificed to economy of fuel, that the caloric engine may be confidently expected to achieve a decided triumph over the condensing steam engine.

Although this discussion has brought us to the conclusion that the new motor is not likely to equal the extravagant expectations which are so widely entertained with regard to its capabilities, still it must be freely conceded that the invention of a new engine, in respect to which a just claim to superiority over the steam engine can be asserted, in any particular, is a great achievement, and that the ingenuity and mechanical skill displayed in the invention and construction of the Caloric Engine cannot be too highly extolled.

Report on Table-Moving.*

When a number of persons sit or stand round a table, their fingers resting slightly upon it, it frequently, though not invariably, happens that the table begins to move; as soon as this motion is perceived, the experimenters follow its course, and turn round and round with more or less velocity; but as soon as the hands are removed from the table it gradually stops.

The latter part of the experiment—namely, the rotation of the table—involves a fallacy, for the rapidity of its movement is in no degree owing to any inherent power of motion in itself, but is solely due to the force unconsciously exerted upon it by the experimenters, and the velocity of the motion is entirely and directly proportionate to the amount of force expended upon it, in addition to the momentum it has already acquired in passing from a state of rest to one of motion. The table no more compels the persons to follow its movements than the garden-roller drags the gardener who pushes it before him; in both cases the *vis a tergo* is the moving force, and the table and the garden-roller do no more than obey the impulse communicated to them.

It must, however, be admitted, that the *first* movement of the table is not so easily explained, for the results of our own experiments, and those of other persons fully deserving of confidence, have placed the fact beyond a doubt, that this movement of the table is performed without any *conscious* effort on the part of the experimenters. It remains, therefore, to be shown by what mechanism this effect is produced, and we shall have no difficulty in solving the problem by reference to physiological principles which are well-known to the Profession. The fact is, that the movement in question is due to *involuntary* muscular action at the ends of the fingers, exerted upon the table. The *direction* of the movement is regulated, not by the *will*, but by the dominant *idea* in the mind, and the term *ideo motor* may very properly express the action in question. It is necessary, however, to explain more fully the class of effects to which the term *ideo motor* may be applied.

It is well known, that the movements of the human body may be divided into *voluntary* and *involuntary*. The actions of walking, of playing musical instruments, etc., are instances of the first; those of circulation and digestion are examples of the second. But there is also a class of actions comprising the ordinary phenomena of motion, which are certainly not under the control of the *will*, but which, nevertheless, are directed by the emotions or the *ideas*. Thus, the somnambulist walks in obedience to some mental impulse, while the will is dormant; and the person who dreams, often executes movements in which the will has no part, but which are excited by *ideas* or emotions. Again, although the will has no control over the action of the heart and arteries, yet the *ideas* and *emotions* exercise a distinct influence upon those organs; and when attention is directed to their pulsations in nervous persons, the movements have been accelerated or retarded, or have become intermittent. Now in all these cases, the ideas or the emotions act upon and direct the movements without the intervention of the will. In the case of table-turning, the ideas are concentrated upon the expected movement, and the muscular apparatus of the fingers obeys, unconsciously to the experimenter, the dominant impression in the mind.

When a table is readily moveable upon its feet, or upon castors, a small amount of force, voluntarily applied by the fingers will cause it to revolve. This mobility is still more obvious when the force is distributed uniformly by a number of persons all round the table.

The amount of muscular force necessarily concerned in accomplishing the revolution is readily procured, independently of will. Let four or five persons place their distributed fingers upon some surface, and retain their position for a few minutes, unrelieved by change; let there be an expectation of some possible result, and there will soon be perceived a tingling in the skin, along the course of the muscles, and a degree of tension, which, without volition, altogether, eventuates in *reflex*, or, as it would be styled in common language, *involuntary* action. In table turning, there need not be any voluntary movement, for muscular tension, provoked by irritation, sensation, emotion, or fixed

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* *London Medical Journal.*

attention, will produce sufficient action to accomplish the expected result.

In order to demonstrate the true character of these phenomena, we ourselves performed some experiments, the particulars of which are subjoined.

June 3, 1853.—*First Experiment.*—Four medical gentlemen sat round a small table, having a stem with three legs, but without castors. Each person placed his fingers lightly on the table, the little fingers of one person touching the little fingers of the person next him, and the *thumbs separated by a considerable interval.* In this experiment, it was determined that no expectant idea should be entertained, that the attention should not be fixed upon the table, and that ordinary conversation should be freely carried on. After sitting for twenty minutes, no effect whatever was produced. The experiment was commenced at 25 minutes past 7, and was continued until 45 minutes past 7.

2*nd Experiment.*—The same gentlemen placed themselves round the table, in exactly the same position as in the last experiment. In this experiment, however, it was determined, that perfect silence should be maintained, that the thoughts should be concentrated upon *some* result, whatever it might be, but that no expectant idea should be entertained as to the direction which the table should take. The experiment was commenced at 12 minutes to 8; at 6 minutes to 8 the table began to move from right to left. After it had moved for some little time, the experiment was abandoned, as it was not thought necessary to follow its circumvolutions. Dr. C—— felt that his left arm was in a state of muscular tension before the table commenced moving. Dr. J—— felt pressure on his right little finger from Dr. C——'s left little finger, the pressure appearing to increase up to the time when the table began to move. Mr. N—— felt a tingling in the skin, as, also, a somewhat painful sense of muscular tension before the table began to move. After it began to move, his fingers and hands unintentionally, but instinctively, accommodated themselves to the movements of the table, the involuntary muscular actions being directed in the axis of movement of the table. Dr. S—— was not conscious of any movement whatever of his own muscles, or of those of the gentlemen to his right and left, and his mind was wholly indifferent as to the direction which the table would take.

3*rd Experiment.*—It was now determined that perfect silence should be maintained, that the thoughts should be concentrated upon the movement of the table, and that an expectant idea should be entertained of the table moving from left to right. The experiment was performed by the same gentlemen as before and in the same positions. It was commenced at 7 minutes past 8, and at 15 minutes past 8 the table began to turn from left to right, but in two minutes it suddenly reversed its direction, and turned from right to left. This latter phenomenon was owing to Mr. N——, (without mentioning the circumstance to the rest,) exerting a distinct voluntary force in the opposite direction to that in which the table was moving.

4*th Experiment.*—The same gentlemen sat down in the same positions as before; but on this occasion it was determined that Dr. C—— and Mr. N—— should anticipate a movement of the table from right to left, but that Dr. J—— and Dr. S—— should entertain the contrary idea. The experiment was commenced at 25 minutes past 8, and it was continued till 20 minutes to 9, but no effect whatever was produced.

June 4th, 1853.—5*th Experiment.*—This experiment was made upon a large, round, drawing-room table, moving upon castors. Eight ladies stood round it, with their fingers resting upon the table, and their little fingers in contact with the little fingers of those standing to their right and left. It was determined to will that the table should move from left to right. In one minute and a half it moved from left to right.

6*th Experiment.*—A lady placed both her hands flat on the table, which in this case was a small and light one; and it moved in two minutes from left to right.

7*th Experiment.*—Four gentlemen and four ladies placed themselves round the large drawing-room table mentioned in the 5th experiment. They assumed successively the standing, the kneeling, and the sitting postures; but, after waiting for twenty-five minutes, no result whatever was produced. The four gentlemen then withdrew, and four ladies then took their places, thus placing eight ladies round the table. It moved in two minutes.

These experiments we consider to be so conclusive, that comment is hardly necessary. The conditions of the bodies to be moved, and of the human forces by which the movement is to be accomplished, are precisely those which, *a priori,* we should have anticipated. A small table is moved more readily than a large one, and it is moved more easily upon an oil-cloth than upon a carpet; it is moved more easily by females than by males, because, in the former, the muscles are more mobile, *the will less strong,* the emotions more acute, the ideas more vivid. It is said that young persons succeed better than persons advanced in years, —a fact which may be readily explained upon the same principles.

We would especially call attention to the few words in the last sentence but one, which state our opinion, that it is *weakness* and not *strength* of will which readiness to assume these involuntary actions testifies. The more powerful the higher faculties of the mind, the less quickly do the muscles act on the impulsion of the ideas only. In men, where the intellect is naturally stronger, and in adults, where it is strengthened by use, the manifestations of ideomotor acts are repressed. And we would call attention to this fact for a practical purpose, viz., with the object of cautioning the public, through our readers, against trying these sort of experiments too often. It is very certain, that each trial renders the "table mover" more ready at exhibiting the required phenomena, more under the dominion of ideas, and less under the dominion of rational will. Each trial then must weaken the intellectual powers, must make the experimenter less a man, and more an instinct-governed animal. The peculiar state of mind induced, is not, perhaps, either hysteria or insanity; but it is akin to both.

The experiment, now so often repeated, of suspending a ring by a thread coiled around the finger, placing the ring within a tumbler, and hearing it strike the glass as many times as correspond to the hour, is a phenomenon analogous to table moving, and very interesting in a physiological point of view. The person who performs the experiment exercises no *voluntary* action upon the movements of the ring; but he knows the hour, and, this acting unconsciously upon the organization, a series of involuntary muscular vibrations are produced, which result in striking the glass the required number of times.

The Progress of Geology.*

Geology is in the ascendant. It counts in its ranks some of the most energetic and able men of science of the day; it claims for its service the only Scientific Society that can bring together a considerable congregation of attentive and intelligent listeners; it occupies and fills, at the annual gathering of the British Association, the largest meeting hall of all the sections, and wins admiration in the Provinces by a yearly sitting of six almost consecutive days, distinguished for the liveliness of the debate and the interest of the subjects discussed; it enforces its importance

* *Westminster Review.*

on the attention of Governments, and into the ears of politicians, usually dull of hearing when addressed concerning matters purely intellectual, or calculated to advance rather than impede human progress. Extensive surveys are instituted for the prosecution of geological research; noble museums are erected for the display of geological treasures; lectureships are endowed for the inculcation of geological truths. A conviction has taken root among the people, that the history of the formation of the earth, and the investigation of its structure and contents, are worthy subjects of national inquiry, and—what with practical men weighs more heavily—likely to prove more conducive to the development of national wealth. A few years ago, geology was perhaps more fashionable and more amusing; as the work became harder, and the talk less diverting, her fashionable friends fell away. But better and truer allies are arising among the masses of the people. Let geology put trust in them, work for them, teach what she has learnt to them, and there shall be greater honors in store for her than can be conferred by the applause of magnates, and the smiles of fine ladies. The hard and horny hand of the miner and mechanic will be frankly proffered for the pledge of fraternity—no languid pressure there, but a warm grasp and hearty shake. The farmer, ever slow and suspicious, will hold back awhile; but the good sense that lies smouldering in this dullest of the avatars of John Bull will, sooner or later, burn up, and, like the light streaming from the eye of a dark lantern, shew science at hand to help, where an enemy and plunderer was suspected.

Neither man not science can work the way to permanent position without a struggle. Whatever is worth gaining must be fought for. The rest of peace, which is faith either in virtue, or in truth, or in order, must be won according to its kind by war moral, or intellectual, or physical. The man whose course through life provokes no enemy, and excites no opposition, must be a nonentity; so, too, with doctrine, discovery, and science. A late eminent and eccentric Scotch naturalist and antiquarian professed to disbelieve the results of his researches, and set about seeking for errors in them, whenever they were at once accepted without opposition or cavil. There was reason in this odd fancy—more than critics gave him credit for. Geology would not have been now what it is, had the path of its progress been less thorny, and its opponents less active. The energy and enthusiasm of geologists has made the growth of their science seem almost magical in rapidity; yet it was no unsubstantial Boletus, springing in a night, or it had been trampled down by its adversaries as fast as it grew. It had, however, its adventitious helps, that served to gain for it the attention of the unscientific and of men of the world. The younger of all the Minervas that have budded from the brain of Jupiter, Geology would have languished, and possibly pined away beneath the cold glances of her stern and mature sisters, and the more damaging enmity of her father's priests, had not paternal love endowed her with an Ægis in the shape of a winning presence, and the gift of the gab. Her missionaries during the time—scarcely yet gone by—when she won her way most rapidly into public favour, were orators and men of mark. There was no mock modesty about her; perhaps not overmuch of the reality of that virtue. Like a woman of genius—and a handsome one, too—she was opinionative and dogmatical; bold in assertions, and apt to let imagination get the mastery over judgement. But these were the failings of healthy youth—the consequences of fullness and richness of blood, and much more likely to end—as they have done—in a sound condition of ripened limb and body, than if they had been substituted by excess of caution, fear of giving offence, shrinking timidity, and dread of authority.

Of the three subjects which seem to suggest themselves most naturally to the inquisitive faculty of the human mind—the constitution of man himself, the constitution of the world upon which he lives, and the constitution of the universe, of which that world forms a part—it is remarkable that the second, and apparently easiest, should have been neglected for ages after earnest study of the other two had commenced and advanced, or was so treated as to be prolific only in vague fancies, and generate no true science. Geology, as contradistinguished from cosmogony, seems to have lain dormant during the brightest epochs of antiquity, and to have excited scarcely a spark of thought, even in the combustable brain of Aristotle himself. A shrewd and accurate observer, old Strabo, it is true, had notions about volcanoes and the isolation of morsels of land, that made a fair approach to geological theorizing; but with this almost solitary exception, it was reserved for modern—in reality, for very modern—philosophers to inaugurate a science which, during its brief infancy and shorter youth, attained the dimensions of a giant, and claimed and won an equal seat with its proudest compeers. Solitary prophets arose from time to time, and seemed in imperfectly understood predictions to foretel the advent of a new philosophy. Great men were among them; men who, in the midst of sterner and fairer pursuits, saw dim indications of mysterious and wonderful workings of the soil beneath their feet, and the mountains that cast long shadows. They asked of themselves, why should there be hills to cast these long shadows; and how grew up the mountain tops? They demanded whether there was not an anatomy to be dissected out of the corpse of mother earth, as in the bodies of her living and moving children? They ventured to think that rugosities of the world's surface were the wrinkles of age, the stamps of ancient cares, the ravages of unrecorded convulsions. They gathered petrifactions out of the rocks, and, comparing them with ejectamenta of the ocean, saw, and what is more, admitted to themselves that they saw, the unquestionable proofs of a similar organization and an identical origin. In Italy especially was a light seen dimly heralding the dawn; and foremost among those who marked the glimmer was that astonishing old painter, Leonardo da Vinci, on whose active mind all the sciences of his time and scraps of sciences then unborn, seem to have been spread in dabs, like the colors on his professional palette. It is a great glory to Italy to have played the part she did in the nursing and nourishing of infant geology. Alas! how many of the children reared by that most beautiful of mothers have been abandoned by her in their childhood, or disowned after attaining their youth or manhood. Not so with this sturdy science; Italy has still her geologists, and good ones too; yet even these might have been denied to her had the training of the infant rested in her care. Under the colder and cloudier skies, amid the rougher and sterner minds of Britain, did geology attain that vigor which has resulted in the strength of an immortal.

Astronomy was the black sheep among the sciences during the middle ages; geology has played that unpleasant part in later and more enlightened times; nay, is even shunned as disreputable by numbers of generally well-informed and well intentioned people at the present day. Although to the honor of the priesthood, not a few of its ablest advocates, and some of its earliest and boldest supporters have come from their ranks, parsons as a body still fight shy of geology and geologists, and were martyrdom by roasting in fashion, we might see Greenough, Lyell, Murchison, De la Beche, Filton, and Mantell all protesting against plutonic agencies at Smithfield, whilst Conybeare, Sedgwick, Henslow, and possibly even the Bishop of Oxford (who knows more of geology than common people give him credit for,) would be doing penance for their unsanctified acquirements in chilly dungeons on a neptunian diet of cold water. The two cardinal sins of geologists in the eyes of good people, are their belief in the world's preadamitic antiquity, and their disbelief in the universality of the deluge. The vague general distrust of them that pervades respectable country society, and concentrates into positive abhorrence in the congregations of Exeter Hall will, when

minutely analyzed, be found to resolve itself into more or less clearly understood objections against the two articles just mentioned. Of course, truth must conquer, and before twenty years are over, the world's antiquity and the partiality of the deluge will be taught to children in schools with no more hesitation than is now entertained about teaching the motion of the earth round the sun. Strange to say, the first of these obnoxious doctrines was treated as an open question by many divines before geological discovery brought facts to bear upon it. Almost exactly two hundred years ago, one of the brightest and purest spirits among the clergy of the Church of England, Dr. Henry More, published his "Conjectural Essay of Interpreting the Mind of Moses."* In this singular treatise he boldly maintained that the narrative of the Creation contained in the commencing chapters of Genesis, professes on principle to describe the appearance (as distinguished from the reality) of things to sense and obvious fancies, "accommodating the outward cortex of Scripture to the most narrow and slow apprehension of the vulgar," and offering "reasons of sundry notable phenomena of nature, bearing altogether a most palable compliance with the most rude and ignorant conceits of the vulgar." In accordance with his somewhat eccentric plan, he makes Moses interpret his history, verse by verse, for the benefit of the more enlightened. His "philosophic" interpretation of the fourth verse of the second chapter of Genesis is very remarkable:—"I (*i. e.*, Moses) do not take upon me to define the time wherein God made the heavens and the earth; for he might do it at once by his absolute omnipotency, or he might, when he had created all substance, as well material or immaterial, let them act one upon the other, and in such periods of time, as the nature of the production of the things themselves required." This curious passage (and the volume containing it) seems to have escaped the researches of Pye Smith and others who battled in controversies about scriptural geology; discussions, the only value of which is their tendency to remove the prejudices or scruples of honest but timid men who fear to confront their faith with scientific truth. Such interpretation as this may prove to them how dangerous it is to lay an overstress on the apparent meaning of passages susceptible of various readings. On the view taken by More of the meaning of the scriptural text cited, the most heretical of cosmogonists, Lamarckian transmutationists, spontaneous generationists, and believers in the doctrines the "Vestiges of Creation," might all stoutly, and with equal reason, maintain that their peculiar tenets are scriptural and orthodox. Let this be a warning to those who would dogmatically put down scientific speculations on religious grounds alone. Let it also be a warning to geologists who are over-anxious to reconcile the literal reading of the Sacred Writings with the logical interpretation of the facts revealed to them in the course of scientific research. We might extend the caution to the best informed of writers upon scriptural geology, and in that category we would place among the foremost Professor Hitchcock, whose recent work, entitled "The Religion of Geology," is the safest and best of an unsafe class. Far superior to Pye Smith in practical acquaintance with his subject, he treats it in a more masterly and convincing style, but the resulting conviction is more in favour of the earnestness of the author than of the soundness of his arguments.

Some of the older and steadier sciences, who having long ago come to years of discretion, ought to have known and behaved better, have been inclined now and then to disparage and trip up their younger and more impetuous sister, whose enthusiasm, haste, and occasional levity, excited their ill-will. The enemies of geology delighted in seeing the slight put upon her by these grave and ancient maidens, who used her very much as the proud sisters treated Cinderella. One cause of dislike arose from the circumstance that the active advocates of geology were not always trained workmen, but volunteers, who had assumed the hammar without previous preparation, or very much consideration respecting its purpose or their own. To see good work done by such undisciplined troops troubled the disciplinarians much in the manner that old soldiers become troubled when they find militia-men fighting a good battle, or amateur tacticians developing excellent plans of warfare. In truth, however, if a man had wished to educate himself regularly into a geologist during the earlier days of the science, there was no school—certainly none in England—where he could be instructed in even the elements of the subject. Things have been altered for the better since, and there are now many opportunities of acquiring the fundamental knowledge desirable for those who would enter upon geological research. In a few years a number of young men will be engaged in occupations of which geology forms, or should form, an element, better trained for their work than any of the builders-up of the science were. The examination papers submitted during this spring to the students of the newly established Government School of Mines would demand for answering a long sitting of even the leading members of the geological Society, and, (just possibly, of course,) might not be answered after all.

It was the tremendous pace at which some of the early geologists went, that threatened to kill their own, and called forth the censures of the slower sciences. They thought nothing of submitting our planet to sudden extremes of heat and cold; shivering it into small fragments as suddenly as a Prince Rupert's drop; doubling it into intricate contortions with the facility (a not unusual illustration) that a pocket-handkerchief or a sheet of paper may be crumpled; melting it down, stirring it up, and keeping a sufficient supply of internal heat to produce a hypertropical climate during immeasurable ages; killing off whole floras and faunas at a moment's notice, and creating a new batch of beasts and vegetables with equal ease and rapidity; swamping the earth with no end of universal deluges; investing it in all but unbounded fluviatile formations; or, wrapping it in a chilling chrystalline coat of solid ice. With them our unlucky planet was fast becoming—

> "A world of wonders, where creation seems
> No more the work of Nature, but her dreams;"

and there is no surer proof of the good stuff of which geology is made, than the awful trials to which she was submitted by her over-zealous disciples.

* "Conjectura Cabalistica; or, a Conjectural Essay of interpreting the mind of Moses, according to a three-fold Cabula—Literal, Philosophical, Mystical, or Divinely Moral. London: 1653.

Repeopling of Streams with Fishes, or Pisciculture.

Communicated by M. J. Nicklès to Silliman's Journal for July.

In my last communication I mentioned briefly the experiments of M. Millet on the reproduction of fishes. I have said that, thanks to the modest fisherman of the Vosges, Rémy, fish is now in fact a manufacture in France,—a fact most valuable to our old Europe, which has hardly the means of sustaining its inhabitants, and whose streams have been depopulated of the good kinds of fish, the spawn having been destroyed by manufactories along the water-courses, by steamboats, drainage works and inundations.

A paper by M. Haxo, Secretary to the Société d'Emulation des Vosges, gives the history of this important invention, and reviews the means employed by Rémy for populating with trout the streams of his neighborhood. The fisherman observed the time when the female deposited its eggs; he remarked that the male then comes and spreads over it the fecundating liquid; and as our observer could but imperfectly protect these eggs from the various chances of destruction, he learned how to imitate nature,

by promoting the parturition of the female, and then that of the male, and placing the eggs in the conditions most favorable for their development; he had thus the happiness of seeing the breeding of a certain number of trout, and noticed their preserving under the venter a part of their eggs, and living during some time at the expense of the rest.

But this was not all: it was necessary to provide for the ulterior preservation of the young animal by a practicable process. The obscure fisherman, who hardly knew how to read, did not yield before this difficuly: he set at work observing again; he placed some frogs in the basin containing the young trout, judging with reason that the spawn of these batrachians would be a resource for the spawn of the trout; he gave them also bits of veal as they grew larger. But as these aliments, though successful, would be too expensive, Rémy, not knowing of the existence of the sciences of botany and chemistry, contrived a process based on one of the great laws of nature. He planted some herbivorous fishes in the water which contained the carnivorous trouts, and from this moment he had no more trouble with the raising of his "elèves." In the course of six years, with very limited means, Remy, who was in the interval associated with Gehin, had bred several millions of salmon and trout. After he had been for six years thus preparing the living food for his fishes, M. Haxo, made known his results to the Academy of Sciences, and the government ordered a full investigation into Remy's process. Pisciculture was established in the basins of the canal of the Rhone, on the Rhine at Luningue, in the department of the Upper Rhine, not under the direction of Remy or of Gehin, but of M. Coste, who had succeeded in appropriating to his own profit the labors of the modest fisherman. A spirited dispute ensued, which continues still, and has engaged several independent pens, as MM. Haxo, Victor Meunier, the journal *La Presse*, the Abbe Moigno, etc.. who defended the rights of the oppressed against the despoiler. Justice will be done; Remy will receive a pension as a national recompense.

The following is briefly the method employed in this new branch of industry. Through M. Millet, Inspector of Forests, the processes are become so simple that they can be executed by the most inexperienced hands. The Administration of the waters and forests, is now organizing a regular service for effecting a re-peopling of the waters of navigable streams. The apparatus of M. Millet is placed in the hands of the fish-keepers, and the living alimentary material will be manufactured, so to speak, at all points. The details which follow are taken from a work yet unpublished on Millet's process, which I have seen in the course of its preparation.

Two boxes of lead, 1 meter long and 1 to 2 decimeters broad, and 5 to 6 centimeters deep, are disposed in steps in the fire-place of his apartments. Some frames or sieves of hair, flags or metallic network, etc., contain the eggs. According to the species, these eggs are immersed to a depth of one or several centimeters. These frames may be withdrawn or replaced at will, by means of tringles which support them by pressing against the side of the box. A reservoir of water, furnished with charcoal and gravel, is near by, and turns into the box, drop by drop, filtered water, furnishing about 2 or 3 litres of water per hour. The water is thus always in motion, and it is only necessary to fill the reservoir each morning to keep the apparatus in action without supervision.

The total expense of the establishment is but 6 francs. With 35 litres of water for six weeks, M. Millet has bred about 25,000 trout or salmon, and he expects to breed some millions of different species in the course of the year.

In order to obtain the eggs from the female, M. Millet employs nearly the process used by Remy and Gehin. He makes the eggs to pass out only as they are mature, leaving an interval of two days between each operation, this consisting in passing the finger lightly over the surface of the abdomen of the female. Another process consists in enclosing the female in a cage with a double bottom, formed of bars rather far apart; the females drop their eggs by organic contraction, and aid themselves in it by rubbing against the bars. The eggs fall upon the frame. The males are then introduced, and often they fecundate at once the eggs, being incited to it by the presence of the female and the odor of the eggs; but if not so, it is provoked by slight friction, as in the ejection of the eggs from the female.

Another result of interest is, that M. Millet has caused trout and like species which live in running streams, to breed in standing waters, by causing some aquatic plants to grow in the water. The species which I have seen employed, was the *Lemna minor* (duck weed.)

This experiment calls to mind the *organic equilibrium* of Mr. Warrington. It is known that this chemist has for several years kept in a glass vase full of water, a small aquatic menagerie, consisting of a *Valisneria spiralis*, several fish, (species of Gasterosteus), and some aquatic univalves, without injuring the purity of the water. It is seen that the carbonic acid and azotized products given out by the animals are absorbed by the plant, which converts at the same time the carbonic acid into oxygen. The debris of the plant serves as nutriment to the snails whose eggs in their turn feed the fish.

The process of M. Millet has been put in practice in several places near Paris, and re-peopling the rivers has been already begun. Contrary to the prescription of Remy and Gehin, who nourished the young for some time on the spawn of frogs and coagulated blood, after the pouch under the venter had disappeared, M. Millet commences the distribution of them whenever this period has arrived. The future will show whether the method just mentioned is wise, or whether it will not be necessary to return to the process of Remy, which consists in "sowing" herbivorous fishes in the streams populated by the trouts. M. Millet is still engaged in his labors, and we shall endeavour to keep our readers acquainted with the progress of this new branch of industry.

On the Origin of Coal-Fields.

By Sir Charles Lyell.

The force of the evidence in favour of the identity in character of the ancient coal-fields, with the deposits of modern deltas, has increased, in proportion as they have been more closely studied. They usually display a vast thickness of stratified mud and fine sand without pebbles, and in them are seen countless stems, leaves, and roots of terrestial plants, free for the most part from all intermixture of marine remains, circumstances which imply the persistency in the same region of a vast body of fresh water. This water is also charged like that of a great river with an inexhaustible supply of sediment, which had usually been transported over alluvial plains to a considerable distance from the higher grounds, so that all coarser particles and gravel were left behind. On the whole the phenomena imply the drainage and denudation of a continent or large island, having within it one or more ranges of mountains. The partial intercalation of brackish water-beds at certain points is equally consistent with the theory of a delta, the lower parts of which are always exposed to be overflowed by the sea even where no oscillations of level are experienced.

The purity of the coal itself, or the absence in it of earthly particles and sand throughout the areas of very great extent, is a fact which has naturally appeared very difficult to explain if

we attribute each coal-seam to a vegetation growing in swamps, and not to the drifting of plants. It may be asked how during river inundations capable of sweeping away the leaves of ferns and the stems and roots of Sigillariæ and other trees, could the waters fail to transport some fine mud into swamps? One generation after another of tall trees grew with their roots in mud, and they had fallen prostrate, had been turned into coal, were covered with layers of mud (now turned to shale), and yet the coal itself has remained unsoiled during these various changes. The lecturer thinks this enigma may be solved, by attending to what is now taking place in deltas. The dense growth of reeds and herbage which encompasses the margins of forest-covered swamps in the valley and delta of the Mississippi, is such, that the fluviatile waters in passing through them, are filtered and made clear to themselves, entirely before they reach the areas which vegetable matter may accumulate for centuries, forming coal if the climate be favorable. There is no possibilty of the least intermixture of earthly matter in such cases. Thus in the large submerged tract called the "Sunk Country," near New Madrid, forming part of the Western side of the valley of the Missisppi, erect trees have been standing ever since the year 1811-12, killed by the great earthquake of that date; Lacustrine and swamp plants have been growing there in the shallows, and several rivers have inundated the whole space, and yet have been unable to carry any sediment within the outer boundaries of the morass.

In the ancient coal of the South Joggins in Nova Scotia, many of the underclays show a net work of Stigmaria roots, of which some penetrate into or quite through older roots which belonged to the trees of a preceding generation. Where trunks are seen in an erect position buried in sandst ne and shale, rooted Sigillariæ or Calamites, are often observed at different heights in the enveloping strata, attesting the growth of plants at several successive levels, while the process of envelopment was going on. In other cases there are proofs of the submergence of a forest under marine or brackish water, the base of the trunks of the submerged trees being covered with serpulæ or a species of spirorbis. Not unfrequently seams of coal are succeeded by beds of impure bituminous limestone, composed chiefly of compressed Modiolæ with scales and teeth of fish, these being evidently deposits of brackish or salt water origin.

The lecturer exhibited a joint of the stem of a fresh water reed *(Arundinaria mascrosperma)* covered with barnacles, which he gathered at the extremity of the delta of the Mississippi, or the Balize. He saw a cane-brake (as it is called in the country) of these tall reeds killed by salt water, and extending over several acres, the sea having advanced over a space when the discharge of fresh water had slackened for a season in one of the river's mouths. If such reeds when dead could still remain standing in the mud with barnacles attatched to them, (these crustaceæ having been in their turn destroyed by a return of the river to the same spot,) still more easily may we conceive the large and firmly rooted Sigillariæ to have continued erect for many years in the Carboniferous Period, when the sea happened to gain on any tract of submerged land.

Submergence under salt water may have been caused either by a local diminution in the discharge of a river in one of its many mouths, or more probably by subsidence, as in the case f the erect columns of the Temple of Serapis. near Naples, to which Serpulæ and other marine bodies are still found adhering.

Sir Charles next entered into some speculations respecting the probable volume of solid matter contained in the carboniferous formation of Nova Scotia. The data he said for such an estimate are as yet imperfect, but some advantages wonld be gained could we but make some slight approximation to the truth. The strata at the South Joggins are nearly three miles thick, and they are known to be also of enormous thickness in the district of the the Albion Mines near Pictou, more than one hundred miles to the eastward. There appears therefore little danger of erring on the side of excess, if we take half that amount or 7500 feet as the average thickness of the whole of the coal measures. The area of the coal-field, including part of New Brunswick, to the west, and Prince Edward's Island and the Magdalen Isles to the north, as well as the Cape Breton beds together with the connecting strata which must have been denuded or must still be concealed beneath the waters of the Gulf of St. Lawrence, may comprise about 36,000 square miles, which with the thickness of 7500 feet before assumed will give 7,527,168,000,000,000 cubic feet, (or 51,136.4 cubic miles) of solid matter as the volume of the rocks. Such an array of figures convey no distinct idea to the mind; but is interesting when we reflect that the Mississippi would take more than two million of years (2,033,000) to convey to the Gulf of Mexico, an equal quantity of solid matter in the shape of sediment, assuming the average discharge of water, in the great river, to be as calculated by Mr. Forshey, 450,000 cubic feet per second, throughout the year, and the total quantity of mud to be as estimated by Mr. Riddell, 3,702,758,400 cubic feet in the year.*

We may, however, if we desire to reduce to a minimum the possible time required for such an operation, (assuming it to be one of fluviatile denudation and deposition,) select as our agent, a river flowing from a tropical country, such as the Ganges, in the basin of which the fall of rain is much heavier, and where nearly all comes down in a third part of the year, so that the river is more turbid than if it flowed in temperate latitudes. In reference to the Ganges, also, it may be well to mention, that its delta presents in one respect a striking parallel to the Nova Scotia Coalfield, since at Calcutta the depth, of eight or ten feet from the surface, bnried trees and roots have been found in digging tanks, indicating an ancient soil now underground; and in boring on the same site for an Artesian well to the depth of 481 feet, other signs of ancient forest-covered lands and peaty soils have been observed at several depths, even as far down as 300 feet and more below the level of the sea. As the strata pierced through contained fresh water remains of recent species of plants and animals, they imply a subsidence, which has been going on contemporaneously with the accumulation of fluviatile mud.

Captain Strachey of the Bengal Engineers has estimated that the Ganges must discharge 4½ times as much water into the Bay of Bengal, as the same river carries past Ghazipore, a place 500 miles above its mouth, where experiments were made on the volume of water and proportion of mud by the Rev. Mr. Everest. It is not till after it has passed Ghazipore, that the great river is joined by most of its larger tributaries. Taking the quantity of sediment at one-third less than that assigned by Mr. Everest for the Ghazipore average, the volume of solid matter conveyed to the Bay of Bengal would still amount to 20,000 millions of cubic feet annually. The Ganges therefore might accomplish in three hundred and senventy-five thousand years the task which it would take the Mississippi, according to the data before laid down, upwards of two million years to achieve.

One inducement to call attenion to such calculations is the hope of interesting engineers in making accurate measurement of the quantity of water and mud discharged by such rivers as the Ganges, Brahmapootra, Indus, and Mississippi, and to lead geologists to ascertain the number of cubic feet of solid matter, which ancient fluviatile formations, such as the coal-measures,

*See Principles of Geology, 8th ed., p. 19.

with their associated marine strata, may contain. Sir Charles anticipates that the chronological results, derived from such sources, will be in harmony with the conclusions to which botanical and zoological considerations alone might lead us, and that the lapse of years will be found to be so vast as to have an important bearing on our reasonings in every department of geological science.

A question may be raised, how far the co-operation of the sea in the deposition of the Carboniferous Series might accelerate the process above considered. The Lecturer conceives that the intervention of the sea would not afford such favorable conditions for the speedy accumulation of a large body of sediment within a limited area, as would be obtained by the hypothesis before stated, namely, that of a great river entering a bay in which the waves, currents, and tides of the ocean should exert only a moderate degree of denuding and dispersing power.

An eminent writer, when criticising, in 1830, Sir Charles Lyell's work on the adequacy of existing causes, was at pains to assure his readers, that while he questioned the soundness of the doctrine he by no means grudged any one the appropriation of as much as he pleased of that "least valuable of all things, past time." But Sir Charles believes, notwithstanding the admission so often made in the abstract of the indefinite extent of past time, that there is, practically speaking, a rooted and perhaps unconscious reluctance, on the part of most geologists, to follow out to their legitimate consequences the proofs, daily increasing in number, of this immensity of time. It would therefore be of no small moment could we obtain even an approach to some positive measure of the number of centuries which any great operation of nature such as the accumulation of a delta or fluviatile deposit of great magnitude may require, in as much as our conceptions of the energy of aqueous or igneous causes, or of the powers of vitality in any given geological period must depend on the quantity of time assigned for their development.

Thus, for example, geologists will not deny that a vertical subsidence of three miles took place gradually at the South Joggins, during the carboniferous epoch, the lowest beds of the coal of Nova Scotia like the middle and uppermost consisting of shallow-water beds. If then this depression was brought about in the course of three hundred and seventy-five thousand years, it did not exceed the rate of four feet in a century, resembling that now experienced in certain countries where, whether the movement be upward or downward, it is quite insensible to the inhabitants, and only known by scientific inquiry. If, on the other hand, it was brought about in two millions of years according to the other standard before alluded to, the rate would be only six inches in a century. But the same movement taking place in an upward direction would be sufficient to uplift a portion of the earth's crust to the height of Mont Blanc or to a vertical elevation of three miles above the level of the sea. In like manner, if a large shoal be rising, or attempting to rise, in mid-ocean at the rate of six inches or even four feet in a hundred years, the waves may grind down to mud and sand and readily sweep away the rocks so upraised as fast as they come within the denuding action of the waves. A mass having a vertical thickness of three miles might thus be stripped off in the course of ages, and inferior rocks laid bare. So in regard to volcanic agency a certain quantity of lava is poured out annually upon the surface, or is injected into the earth's crust below the surface, and great metamorphic changes resulting from subterranean heat accompany the injection. Whether each of these effects be multiplied by fifty thousand, or by half a million or by two million of years, may entirely decide the question whether we shall or shall not be compelled to abandon the doctrine of paroxysmal violence in ancient as contrasted with modern times. Were we hastily to take for granted the paroxysmal intensity of the forces above alluded to organic and inorganic, while the ordinary course of nature may of itself afford the requisite amount of aqueous, igneous, and vital force, (if multiplied by a sufficient number of centuries,) we might find ourselves embarrassed by the possession of twice as much mechanical force and vital energy as we require for the purposes of geological interpretation.—*Sill. Jour.*

The Northern Railway.

The conveyance of a party of gentlemen from Toronto to Bradford, by a Special Train, on Wednesday, the 6th July, at the instance of the Chief Engineer and the Superintendent of this line, is an event which we chronicle with particular pleasure, and some degree of pride. It is indeed a matter of no small moment to Western Canada, and especially to Toronto, that it is now possible to pass from Lake Ontario at a speed exceeding forty miles an hour, over an elevation of more than 730 feet, to the landing place on Lake Simcoe, in direct, though not yet available communication with the world of waters to the west.

It is, however, in relation to the local advantages which the Northern Railway confers upon the fertile country through which it passes, that we are as yet enabled to speak with that certainly which actual observation and experience permit. Many portions of the extensive country traversed by the line, cannot fail to impress the passing stranger with a well grounded conviction of its admirable adaptation to support a dense and independant population. Of the wild beauty of mountain scenery Western Canada itself, can scarcely boast, and certainly none is to be found on the Northern line, as far as Bradford; but of undulating plains of extraordinary fertility, a teeming soil and a healthy, industrious population, of these lesser, but more desirable attractions, a rich share is strewn around its path.

The part of the Northern Line so rapidly passed over by the Express Train, on July 6th, is 42 miles in length, and connects Lake Ontario with Lake Simcoe. The Station on the last named Lake is very fortunately situated upon a deep and navigable river which empties itself into the Lake, about seven miles from the substantial railway bridge, recently thrown across it. Above the bridge the river is navigable for many miles, and thus establishes an easy and rapid communication between a very extensive and fertile inland country, and the only port accessible throughout the year, on the North Shore of Lake Ontario.

Although the line has been opened for a very few weeks, yet it seems to have given already an extraordinary impetus to the growth of the villages through which it passes. The present interest attached to the northern line, is not confined to the fact that it is the first railway which has been opened for so long a distance in Western Canada, or that the speed attained by a Special Train, nearly equalled the usual rapidity of the English Express trains; it is something to know that the *materiel* of the line, the Locomotive and Cars, are in themselves, admirable illustrations of the rapid progress we are making in the mechanical arts. Canadian White Oak and Bird's Eye Maple, give a lightness and brilliancy to the First Class Passenger Cars, which we have

rarely seen equalled, and as to the ease and comfort of the whole of their internal arrangements, it would be gilding refined gold to have them surpassed.

As a portion of the line is still unballasted, the extraordinary rapidity with which the train moved down some of the inclines, naturally gave to it a disagreeable oscillatory movement, which will of course be materially diminished when the ballasting is completed. We do not suppose, however, that it is in contemplation at present to run regular passenger trains, at the speed we have already alluded to. After some months traffic the irregular oscillations will probably cease by the increased stability of the track.

To the enterprise and energy of Mr. Good of Toronto, the public are indebted for the construction of the powerful locomotive, which brings the lakes within an hour's ride of one another; and to Messrs. McLean and Wright, for the luxurious passenger cars, which exhibit a neat taste in design, and appropriate skill in workmanship. The gentlemen who participated in the rare pleasure of the trip, are indebted to the politeness of Mr. Cumberland, the Chief Engineer, and to Mr. Brunel, the Superintendent of the line, who added to the obligations of their guests, by providing most abundant and delicious refreshments, appropriately arranged in a second class carriage. We have been favoured with the dimensions of the curves, and data connected with the grading of the line as far as Bradford. The remarks which we have prepared on these and other associated subjects, want of space compels us to withhold, until the August number of the *Journal.*

Montreal Natural History Society.

The twenty-fifth annual report of the Natural History Society of Montreal is a very encouraging document. It indicates the revival among its present members of that vigorous spirit which inspired its first promoters, when they founded and sustained for a season, "the pioneer in this country of the development of its Natural History."

We notice with much pleasure the compliment paid by the Council to their indefatigable President, Major Lachlan. Every member of the Canadian Institute, recalling the incidents of the late Annual Conversazionè, will readily acknowledge the influence which even one active and zealous individual may exercise upon the usefulness and prosperity of a Scientific Society; particularly in a country whose rich domains of Natural History and Science have hitherto found few discoverers willing to communicate to the public the results of their enquiries. We transcribe with cordial feeling, the following allusion, by the Montreal Natural History Society, to the valuable services of their President.

"In referring to the transactions of the past year, your Council experience some difficulty in selecting those of the most interest; but they would be wanting in due regard to the general feelings of the Society, were they to refrain from asking especial attention to the very valuable services of our President, Major R. Lachlan, who succeeded to the chair in October last, consequent on the removal from the city of its former occupant, Dr. Sewell. Your President has been indefatigable in his endeavors to resuscitate the Society; his personal labors in connection therewith have been unremitting, and the value thereof is fully substantiated by, among other advantages, the greatly increased subscription list, the success of the first *soiree*, held on the evening of the 12th April last, and the prospect of a volume of Transactions being published ere long. The Council are quite convinced that the Society will fully recognize and acknowledge the merits of its Chief, who has contributed so much in reinvigorating the character of its proceedings, and giving an impetus thereto, which, it is sincerely hoped, no untoward circumstances may arise to arrest or retard."

The Museum of the Society has received many important accessions; especial reference is made by the Council to the liberality of one of its members.

"The Council, however, trust it will not be considered invidious in making special reference to the extensive donations of Dr. Gibb, one of our members, consisting as they do of above 300 specimens in various departments of Natural History and comparative Anatomy, and an equally large collection of miscellaneous and rare articles, from all quarters of the Globe."

An extensive and well arranged museum is an admirable acquisition, and furnishes in itself a most prolific field for private study, and very desirable opportunities for illustrating public lectures. We rejoice in the renovated energies of the Montreal Natural History Society, and cordially wish that they may be sustained in healthy and vigorous action.

The Observatory.

In our last issue we informed our readers that the Magnetic Observatory at Toronto, established by the Imperial Government and supported by them for a period of twelve years, had been taken in charge by the Provincial authorities, with the intention of being retained as a permanent establishment: we are now able to give more detailed information on the subject.

Some time in February last, Captain Lefroy received orders from the home-government to pack up the instruments, dismantle the observatory ahd return home with the military detachment which had been, under his superintendence, employed in the observations. With his usual zeal and energy, he lost no time in bringing the matter to the notice of his Excellency the Governor General, urging the importance and interest of the scientific results that might be expected from retaining an observatory complete in all points and which had already earned a reputation second to none throughout the world. In these representations he was powerfully backed by the petitions of our own and kindred societies in both sections of the Province. With most praiseworthy promptitude and liberality, the Provincial authorities at once communicated with the Imperial Government offering to purchase the equipment of the observatory in full, and in the same spirit they were responded to, and the negociation completed without delay. The munificent sum of £2000 voted for this purpose in the last session of Parliament gives a striking and most pleasing proof of the esteem in which Science is held in this country.

In the meanwhile Captain Lefroy had returned to England, leaving, however, the Military Detachment behind, and formally placing the Observatory, according to his instructions, under the charge of Mr. Cherriman. The Magnetical Observations had been in part interrupted by the introduction of Iron during the

process of packing some of the Instruments which could not be left behind, and also by nearly all the Instruments having been dismounted for the purpose of final verification. Their adjustment of course occupied some time, but it is now completed, and the full observations are now made as before. The Meteorological observations have never been at all interrupted. Instruments to replace those taken away, besides others which it has been thought advisable to introduce, have been ordered from England, and are daily expected, and certain necessary repairs and alterations will be commenced as soon as the plans for them can be procured.

The Military Detachment so long employed on this service, has been permitted by Her Majesty's Government to remain here for so long a period as may be necessary to enable Mr. Cherriman to make a report to His Excellency, of the staff that will be required, and of the steps that may be advisable to render the establishment permanently effective and complete.

We cannot conclude without congratulating the Province upon the completion of arrangements which secure to Western Canada this extensive and well appointed Magnetic and Meteorological Observatory, under a gentleman whose distinguished career at the University of Cambridge is sufficient guarantee that all the interests of Science will be as industriously and efficiently maintained as they have hitherto been, within the same walls, under that management which has given to it the wide spread and exalted reputation it now enjoys throughout the scientific world.

The Canadian Journal.

At the conclusion of the First Volume of the Canadian Journal, we have much pleasure in informing its supporters and contributors that the whole of the present edition, with the exception of a few copies, reserved for the purposes of the Institute, has been subscribed for. We may also state that it is confidently anticipated that the circulation of the journal during the year 1853-4, will be such as to cover all the ordinary expenses of its publication. In view of an extended circulation, the Council of the Institute have made arrangements for a very considerable increase in the monthly issue.

How to Preserve Potatoes from the Rot.

Thoroughly dried potatoes will always produce a crop free from disease. Such is the positive assertion of Mr. Bollman, one of the Professors in the Russian Agricultural Institution at Gorigoretsky. In a very interesting pamphlet by this gentleman, which has just reached us, it is asserted as an unquestionable fact, that mere drying, if conducted at a sufficiently high temperature, and continued long enough, is a complete antidote to the disease.

The account given by Professor Bollman of the accident which led to this discovery is as follows:—He had contrived a potatoe-setter, which had the bad quality of destroying any sprouts that might be on the sets, and even of tearing away the rind. To harden the potatoes, so as to protect them against this accident, he resolved to dry them. In the spring of 1850, he placed a lot in a very hot room, and at the end of three weeks they were dry enough to plant. The potatoes came up well, and produced as good a crop as that of the neighboring farmers, with this difference only, that they had no disease, and the crop was, therefore, upon the whole, more abundant. Professor Bollman tells us that he regarded this as a mere accident; he, however, again dried his seed potatoes in 1851, and again his crop was abundant and free from disease, while everywhere on the surrounding land they were much affected. This was too remarkable a circumstance not to excite attention, and in 1852 a third trial took place. All Mr. Bollman's own stock of potatoes being exhausted, he was obliged to purchase his seed, which bore unmistakable marks of having formed part of a crop that had been severely diseased; some, in fact, were quite rotten. After keeping them for about a month in a hot room, as before, he cut the largest potatoes into quarters, and the smaller into halves, and left them to dry for another week. Accidentally the drying was carried so far that apprehensions were entertained of a very bad crop, if any. Contrary to expectation, however, the sets pushed promptly, and grew so fast that excellent young potatoes were dug three weeks earlier than usual. Eventually, nine times the amount planted was produced, and although the neighboring fields were attacked, no trace of disease could be found on either the herbage or the potatoes themselves.

This singular result, obtained in three successive years, led to inquiry as to whether any similar cases were on record. In the course of the investigation, two other facts were elicited. It was discovered that Mr. Losovsky (living in the government of Witebsk, in the district of Sebege,) had for four years adopted the plan of drying his seed potatoes, and that during that time there had been no disease on his estate. It was again an accident which led to the practice of this gentleman. Five years ago, while his potatoes were digging, he put one in his pocket, and on returning home, threw it on his stove (*poele*,) where it remained forgotten till the spring. Having then chanced to observe it, he had the curiosity to plant it, all dried up as it was and obtained an abundant and healthy crop; since that time the practice of drying has been continued and with great success. Professor Bollman remarks that it is usual in Russia, in many places, to smoke dry flax, wheat and rye, and, in the west of Russia, experienced proprietors prefer for seed, onions that have been kept over the winter in cottages without a chimney. Such onions are called *dymka*, which may be interpreted smoke-dried.

The second fact is this:—Mr. Wasileffsky, a gentleman residing in the government of Mohileff, is in the habit of keeping potatoes all the year round by storing them in the place where his hams are smoked. It happened that, in the spring 1852, his seed potatoes, kept in the usual manner, were insufficient; and he made up the requisite quantity with some of those which had been for a month in the smoking place. These potatoes produced a capital crop, very little diseased, while at the same time the crop from the sets which were not smoke-dried was extensively attacked by disease. Professor Bollman is of opinion that there would have been no disease at all, if the sets had been better dried.—*Gardener's Chronicle.*

Marbleized Iron and Stone.—The manufacture of iron imitations of marble has become an extensive branch of business in New York, although it is but little more than a year old. We have before alluded to the process as being chiefly used for mantlepieces; but it is anticipated that it will hereafter be applied to many other purposes; it may be used to imitate any sort of wood, or any other polished surface, as well as stone, the closeness of the imitation depending solely on the skill of the artist by whom it is prepared. Care has, however, to be taken not to hit a hard blow upon the surface and not to scratch it. If you scratch marble, the furrow only reveals the same substance as you beheld on the exterior, but with polished iron the case is very different. The same mode of giving a stony face and polish may be applied to wood, Plaster of Paris, terra cotta, and other substances, as well as iron; it is far superior to scagliola in every respect, and must expel that substance from use altogether. We look to see it applied most extensively, especially in architecture. It makes very handsome pillars, pilasters, and vases for the inside of houses. A different way of producing a result similar to that above spoken of has been discovered by Professor Freund, a Hungarian chemist, for sometime resident in New York; it is chemical and mechanical, the imitations of stone being produced entirely without the pencil of a painter. The elements of the stone desired to be imitated, are chemically combined, and finally polished by grinding or rubbing with water, pumice stone, &c., much as the stone itself would be. For architectural purposes this process produces very beautiful work, far superior to any scagliola; we have seen pillars and wainscotting with all the loveliness of the finest jaspar or agate.—*Liverpool Albion.*

The first vessel of the Australasian Steam-ship Company (Panama Sydney), about to commence operations in New York, will, it is stated, be a new one just completed, called the *Golden Age.* She is of 2364 tons burthen, and has capacity for 1200 passengers (200 first cabin, 200 second, and 800 third), with 1200 tons of coal, and 500 of cargo. It is expected she will enable the passage to Australia to be completed within thirty-five days from New York, and fifty days from England.

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, June, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

Latitude—45 *deg.* 32 *min. North.* *Longitude*—73 *deg.* 36 *min. West.* *Height above the Level of the Sea*—118 *ft.**

Day.	Barom: corrected and reduced to 32° Fahr. 6 A. M.	2 P. M.	10 P. M.	Temp. of the Air. 6 A. M.	2 P. M.	10 P. M.	Tension of Vapour. 6 A. M.	2 P. M.	10 P. M.	Humi'y of the Air. 6 A. M.	2 P. M.	10 P. M.	Direction of Wind. 6 A. M.	2 P. M.	10 P. M.	Velocity in Miles per Hour. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0. 6 A. M.	2 P. M.	10 P. M.	REMARKS.
1	29.967	29.908	29.862	52.1	76.1	62.3	0.299	0.171	0.397	.74	.51	.71	S	E b S	E	0.65	1.00	1.39		C.C. St. 9.	Cirr. 4.	C.C. Str. 9.	
2	.875	.752	.667	58.0	79.2	66.0	.400	.568	.500	.81	.58	.78	E b N	E b S	E b S	0.17	2.03	2.77		Str. 10.	Light Cirr.	C.C. Str. 6.	
3	.569	.470	.603	65.1	83.1	60.6	.527	.617	.431	.85	.56	.79	S b E	W S W	N E	6.81	13.33	9.70	Inap.	do 10, T'dr	C.C.S. 1,T'r	C. Str. 8.	
4	.791	.864	.880	51.0	71.0	54.4	.516	.481	.373	.81	.64	.87	N E	N E	W S W	20.10	14.12	Calm.	Inap.	Str. 10,	Cum. 1.	Clear.	
5	.873	.783	.767	60.6	78.1	65.2	.407	.550	.510	.75	.58	.82	S b W	W b N	S W	0.37	2.66	0.81		Clear.	Cir. 3.	Cum Str.4.	
6	.573	.397	.344	69.4	78.6	70.0	.513	.704	.628	.72	.74	.86	S	E N E	S b E	4.33	4.80	9.29	0.629	Light Cirr.	Cir. C. Str.	Thunder.	Storm at noon.
7	.361	.305	.336	71.0	80.7	59.2	.617	.588	.380	.82	.58	.75	S W	S W	NW b W	6.33	7.80	8.75	0.540	C. St. 9.	Thun. St'm	Clear.	
8	.645	.776	.821	52.6	68.6	55.0	.283	.470	.381	.70	.69	.86	NW b W	W b S	S W	4.62	2.97	3.13		C. St. 9.	Cum. Str. 2	Clear.	
9	.909	.767	.761	60.4	77.0	62.1	.371	.787	.445	.71	.86	.79	S S E	S E	S E	0.27	5.32	3.25		Clear.	Cum. Str. 4	Str. 2.	
10	.792	.729	.758	69.3	72.1	65.7	.461	.670	.581	.65	.86	.90	NW b W	N E b N	S E	3.73	3.80	9.38	0.186	Clear.	Showers.	Clear.	
11	.919	.889	.954	63.1	76.6	69.2	.371	.442	.571	.65	.50	.52	N E b N	E b N	E b N	8.20	5.00	0.40		Clear.	Clear.	Clear.	
12	30.070	.968	.868	56.4	77.9	60.1	.305	.607	.451	.66	.64	.86	N E	W N W	SW b S	6.79	2.68	0.67		Clear.	Clear.	Clear.	
13	29.811	.677	.712	61.8	82.2	71.3	.456	.727	.648	.84	.68	.86	W b S	W S W	W S W	2.03	10.95	8.10	0.093	Slight Rain	Clear.	Clear.	
14	.783	.692	.698	70.0	91.3	76.0	.489	.739	.727	.67	.53	.82	N E b N	S b W	S S W	1.25	1.50	3.66		Clear.	Clear.	Light Cir.	Aurora Borealis.
15	.665	.572	.573	74.8	94.8	78.1	.670	.739	.670	.78	.53	.71	S S W	W S W	W S W	5.20	5.51	4.12		Clear.	Clear.	Clear.	
16	.590	.465	.402	75.0	97.0	72.1	.670	.776	.640	.78	.56	.83	W b S	S W	SW b W	3.16	1.58	6.31	Inap.	Clear.	Clear.	C.C. Str. 3.	
17	.373	.350	.433	76.0	83.0	66.1	.628	.681	.549	.71	.61	.87	S W	W b S	N N W	2.94	7.64	7.49	0.266	Clear.	Cum. Str. 4.	Cum-Str.4.	
18	.573	.518	.436	56.6	72.2	61.6	.363	.450	.456	.79	.58	.84	W N W	W	W S W	10.00	7.98	5.63	Inap.	Clear.	Str 2.	C. Str. 10.	
19	.591	.552	.563	60.2	79.2	62.2	.393	.628	.421	.75	.64	.75	NW b W	W b N	S W	9.63	4.31	4.21		Cirr. 2.	C. C. Str. 2.	C. Str. 4.	
20	.455	.481	.485	63.6	86.7	78.0	.516	.787	.638	.89	.65	.67	S b W	W S W	W b N	1.65	4.13	8.73	0.066	Showers.	Cir. Str. 8.	Cir. 2	Eclipse of moon.
21	.621	.598	.648	61.0	72.3	63.7	.412	.450	.435	.76	.58	.75	N E b N	N E b N	E N E	7.91	5.43	0.75		Cir. C. 5.	C. C. Str. 4.	Str. 9.	
22	.697	.627	.633	59.0	61.1	60.9	.416	.364	.441	.84	.66	.84	N E b E	N E b E	N E b N	2.66	6.52	5.35	0.706	St. 10, Th'r.	Showers.	Clear.	
23	.498	.368	.297	60.4	90.6	74.3	.441	.854	.715	.84	.62	.86	N E b E	E b S	S b W	1.92	9.22	8.16	0.445	Clear.	Clear.	S. 4, Th'er.	
24	.418	.471	.516	59.0	71.7	59.8	.402	.559	.426	.79	.74	.84	NW b W	W N W	W	14.12	12.78	8.45	Inap.	Cir. C. Str.4	Cir. Str. 2.	C. Str. 5.	
25	.630	.644	.722	53.6	57.8	50.0	.315	.398	.304	.76	.84	.81	W N W	W	W	5.28	9.41	5.62	0.200	Light Cir. 2	Cir. Cum. 6	Str. 3.	
26	.817	.783	.803	52.0	64.1	56.8	.304	.504	.385	.76	.84	.84	NW b W	W	W S W	7.77	5.00	6.75		Cum. Str. 5.	Cirr. Str. 5.	Cir. Str. 4.	
27	.748	.639	.661	55.7	76.3	59.7	.394	.634	.426	.88	.72	.90	N E b E	S S W	N E b E	7.91	5.43	0.75		Clear.	Cir. Cum. 4	Clear.	
28	.712	.648	.618	61.6	82.8	65.0	.431	.763	.510	.79	.71	.81	N E b E	S S W	S S W	0.12	0.63	1.22		Clear.	C. C. Str. 4.	C. Str. 8.	
29	.632	.575	.582	66.2	81.1	71.0	.489	.638	.617	.76	.61	.82	S b E	S S E	S E	0.02	2.92	5.33	Inap.	Cirr. Str. 3.	Cirr. Str. 5.	C. Str. 8.	
30	.601	.524	.487	67.1	82.2	72.6	.455	.597	.578	.69	.55	.74	S E	W S W	W S W	1.00	8.00	9.50		Cum. 2.	Cir. Cum. 1.	Clear.	Faint Aurora Bor'lis

Barometer.	Highest, the 12th day	30.070
	Lowest, the 23rd day	29.277
	Monthly Mean	29.648
	" Range	0.793
Thermometer	Highest, the 16th day	99.°2
	Lowest, the 1st day	39.0
	Monthly Mean	68.66
	" Range	60.20

Mean of Humidity—.739.
Greatest Intensity of the Sun's Rays—134.°0.
Amount of Evaporation—3.41 inches.
Most Prevalent wind—W. S. W.
Least do. do. E.

Most Windy Day—the 24th day, mean—11.78 miles per hour
Least Windy Day—28th, mean—0.65 miles per hour.
Rain fell on 15 days—amounting to 3.131 inches, and was accompanied by thunder on five days.
Aurora Borealis visible on 2 nights.
Eclipse of the moon invisible, owing to dense clouds.
Fire-flies first seen, 10th June.

The electrical state of the atmosphere has been marked *generally* by moderate intensity of Positive Electricity, and during the storms of Thunder *generally* indicated a very high tension of a negative character.

Monthly Meteorological Register, at the Provincial Magnetical Observatory, Toronto, Canada West.—June, 1853.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario : 108 feet.

Magnet	Day.	Barom. at tem. of 32 deg. 6 A. M.	2 P. M.	10 P. M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Wind. 6 A. M.	2 P. M.	10 P. M	Rain in Inch.	S'nw in Inch.
						°	°	°	°													
c	1	29.801	29.758	29.703	29.749	49.7	61.6	58.9	57.58	0.297	0.316	0.414	0.332	85	59	85	72	N E b E	N W b W	E N E	- -	- -
e	2	.709	.632	.536	.611	57.4	68.2	62 8	62.80	.389	.475	.477	.442	84	71	85	80	Calm.	E b S	Calm	0.025	- -
d	3	.520	.512	.696	.585	64.3	80.8	58.2	69.07	.513	.512	384	.467	87	50	81	69	S W b W	W b S	N N W	- -	- -
b	4	.774	.861	.837	.827	59.2	64.3	50.3	57.77	.420	.422	.287	.366	86	72	80	78	N	S S E	Calm.	- -	- -
c	5	.801	.764			55.3	58.6			.346	.338			81	70			Calm.	E b S	—	- -	- -
b	6	.490	.317	.344	.372	56.2	72.6	62.1	64.82	.430	.647	.482	.547	97	83	88	90	Calm.	S	S S W	0.210	- -
c	7	.396	.508	.688	.541	64.3	67.1	48.5	59.87	.541	.396	.286	.412	92	61	85	80	W	W N W	Calm	- -	- -
a	8	.787	.785	.763	.783	49.4	63.2	54.6	56.28	.313	.384	.312	.355	91	69	75	80	Calm.	S E b E	E b N	- -	- -
b	9	.781	.679	.649	.698	52.1	65.2	57.4	60.08	.331	.431	.403	.399	86	72	87	79	E N E	E	Calm.	- -	- -
a	10	.701	.683	.755	.714	60·4	75.5	64.3	67.43	.447	.609	.467	.515	87	72	79	79	Calm	S S E	N b W	- -	- -
a	11	.845	.901	.902	.891	61.1	71.4	57.8	64.90	.364	.568	.387	.470	89	76	83	81	N b E	S E b E	E b S	- -	- -
b	12	.982	.955			61.0	69.5			.425	.458			81	65			N E b N	E	—	- -	- -
d	13	.842	.759	.753	.780	58.1	86.3	69.6	71.10	.342	.664	.557	.545	73	54	80	73	Calm	W	Calm.	Inap	- -
eb	14	.771	.729	.688	.728	66.6	83.3	71.5	75.22	.549	.761	.650	.681	87	69	87	81	S	S	N E b E	0.030	- -
ae	15	.691	.630	.544	.613	68.5	84.9	67.3	74.98	.610	.739	.522	.644	91	63	80	76	Calm	S	Calm	- -	- -
c	16	.566	.487	.405	.479	68.2	81.3	67.2	73.37	.586	.720	.618	.626	88	69	96	80	Calm	S E b E	W	0.220	-
b	17	.412	.470	.625	.510	68.9	75.4	58.2	67.15	.612	.428	.364	.455	90	50	77	71	S b E	W N W	N.WbW	- -	- -
c	18	.628	.554	.515	.559	54.8	68.7	69.1	65.37	.321	.442	.452	.421	77	65	65	68	Calm	S b W	S b W	Inap	- -
c	19	.606	.579			63.9	72.3			.501	.589			87	76			Calm	S E b E	—	Inap	- -
d	20	.501	.481	.550	.511	68.2	86.3	70.4	74.65	.598	.750	.609	.666	90	61	85	81	E	S S W	N b E	- -	- -
d	21	.588	.535	.507	.550	63.0	71.2	67.2	67 97	.498	.516	.497	.523	88	70	76	79	N b W	E	N. E	- -	- -
e	22	.521	.482	.463	.480	65.3	75.7	67.3	70.85	.506	.667	.561	.595	84	78	87	81	N E	E b S	E	- -	- -
b	23	.365	.269	.469	.373	70.2	78.9	60.3	68.57	.647	.686	.372	.571	90	72	73	81	E b S	S S W	N N W	0.040	- -
ca	24	.579	.553	.697	.609	54.6	69.6	49.5	59.07	.354	.424	.281	.348	85	60	81	72	N W b W	W	Calm.	- -	- -
d	25	.763	.730	.763	.758	46.2	59.8	45.2	51.48	.258	.296	.233	.273	83	59	79	73	N W	W b N	Calm.	0.045	- -
a	26	.824	.792			49.5	72.1			.284	.404			81	53			Calm	S b E	—	0.895	- -
b	27	.569	.531	.599	.562	44.9	60.4	58.9	56·43	.292	.470	.462	.427	99	91	94	94	E N E	N E b E	Calm.	0.005	- -
b	28	.646	.658	.562	.618	59.6	68.3	60.4	63.40	.473	.562	.435	.500	94	85	85	88	N N E	S E b S	Calm.	0.080	- -
a	29	.528	.559	.575	.557	62.5	77.8	68.6	70.17	.516	.730	·628	.630	94	80	93	88	N E	Calm	Calm.	- -	- -
a	30	.619	.603	.586	.599	66.1	78.0	67.8	72.38	.544	.685	·473	.559	87	74	71	73	Calm	S S W	N N E	- -	- -
—																						- -
	M	29 631	29.603	29.622	29.618	59.99	72 92	61.28	65.49	0.452	0.550	0.447	0.491	88	69	82	79	Ml's 1.83	Ml's 7.08	Ml's 2.80	1.550	- -

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
985.62	876.95	798.80	831.68

Mean velocity of the wind - - 3.67 miles per hour.
Maximum velocity - - - - - 18.3 ml's per h'r, from 8 to 9 p.m. on 3rd.
Most windy day - - - - - 23rd: Mean velocity, 7.98 miles per hour.
Least windy day - - - - - 28th: Mean velocity, 1.65 ditto.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

Highest Barometer - - 29.982, at 6 A.M., on 12th. } Monthly range:
Lowest Barometer - - 29.265, at 4 P.M., on 23d. } 0.717 inches.
Highest observed Temp.- 89.5, at 2.45 P.M., on 13th } Monthly range:
Lowest regist'd Temp. - 39.2, at A.M., on 25th } 50.3
Mean Highest observed Temperature - - 74.05 } Mean daily range:
Mean Minimum Thermometer - - - - - 54.28 } 19.77
Greatest daily range - - - - -32.8 from noon of 23rd, to A.M. of 24th.
Warmest day - - 14th - - - Mean Temperature - 75.22 } Difference:
Coldest day - - - 25th - - - Mean Temperature - 51.48 } 23.74

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for June.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity.
	°	°	°	°					Miles.
1840	60.0	78.5	37.1	41.4	11	4.860	0	--	-
1841	65.6	92·8	45.7	47.1	9	1 560	0	--	--
1842	55 6	73.9	28.0	45 9	15	5.755	0	--	--
1843	58.4	81.3	28 5	52.8	12	4 595	0	--	--
1844	59.9	82.8	33.1	49.7	9	3 535	0	--	
1845	61.0	83.6	40.9	42.7	11	3.715	0	--	-
1846	63.3	83 3	41 5	41.8	10	1.920	0	--	--
1847	58.4	78.3	36.7	41.6	14	2.625	0	--	--
1848	62.9	92.5	38.3	54.2	8	1.810	0	--	4.51
1849	63.2	84.9	45.2	39.7	7	2 020	0	--	3.32
1850	64.3	83.2	49.0	34.2	10	3.345	0	--	4.54
1851	59.2	79.2	41.2	38.0	11	2.695	0	--	4.42
1852	60.8	86.1	43.6	42.5	10	3.160	0	--	4.09
1853	65.5	89.5	39.2	50.3	12	1.550	0	--	3.67
M'n	61.3	83.6	39.1	44.4	10.6	3.082	0		4.09

This month has been distinguished not only by great dryness—the amount of rain fallen being the least in the corresponding series of 13 years—but also by excessive variability of temperature on particular days above and below its normal value. It will be seen by reference to the comparative table that the mean of the whole month is the highest known since the year 1841 ; and the maximum temperature is only exceeded by 1841 and 1848, while the minimum is just at its average value, so that the range, which is excessive, lies wholly towards the high temperatures. The variations on particular days will be seen by the following table, which gives the difference of the mean temperature of each day above or below the normal temperature of that day.

June.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Difference.	0.6	5.5	11.5	-0.1	S	6.2	1.4	-2.8	0.6	7.7	4.9	S	10.5	14 4	13.9	12.0	5.5	3.4	S	12.2	5 3	7.9	5.4	-4.3	-12.1	S	-7.6	-6.9	5.7	7·8

The group of hot days from the 13th to the 16th has never been equalled, and the group of cold days from 24th to 28th is also remarkable.

Fine display of Aurora on June 1st, accompanied by a perfect arch, stretching about N. W. and S. E., with its vertex a few degrees south of the Zenith. Possible to see Aurora on 25 nights ; Aurora actually seen on 4 nights.

At 12.30 P. M. on 23rd, a lunar halo was seen, inner radius 23° 30′; its inner rim shewed comparative darkness, being well defined: a paraselena appeared on its western edge, throwing out a tail from the moon, and having the same altitude as the moon. Shortly afterward another appeared at the same distance on the Eastern side, with an arch of a horizontal circle passing through the moon, at whose intersection with the halo the paraselena was formed. This latter exhibited the prismatic colors, red on the inside, light-green on the outside, and threw a tail from the moon along the horizontal circle.

Abstract of Meteorological Observations

Made at the Magnetical Observatory, Toronto, Canada West, from January 1840 to June 1853 inclusive.

1840.

Month	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warmst day. Date.	Temp.	Coldest day. Date.	Temp.	Toronto Bay. Date.	Temp.	Rain in inches.	No. of days. Rain.	Snow.	Fair.	Elasticity.	Humidity.
	°	°	°	°	°	°		°		°		°						
Jan.	17.7	36.7	-18.	55.3	14.0	31.5	10	32.10	16	-3.85	not	observd	1.395	4	11	16	Imper	fect
Feb.	29.0	50.3	-10.	60.8	12.4	32.0	20	43.35	4	3.30			1.475	4	6	15		
Mar	33.1	58.6	9.2	49.4	15.0	33.7	4	44.20	11	20.60	21	36.0	1.640	8	8	15	.173	.88
Apr	42.7	68.7	22.8	45.9	15.2	27.5	23	60.30	7	31.30	23	47.0	3.420	14	2	14	.211	.76
May	51.2	76.4	31.2	45.2	18.0	31.5	28	66.6	9	41 90	21	60.0	4.150	9	..	22	.309	.73
Jun.	60.3	79.9	36.7	43.2	16.8	25.3	29	70.70	8	50.70	25	61.6	4.860	11	..	19	.402	.78
July	66.3	82.3	47.0	35.3	17.7	27.2	16	73.10	2	57.70	18	64.2	5.270	6	..	25	.498	.78
Aug	65.1	82.4	47.7	31.7	17.9	29.9	22	73.00	15	56.80	20	69.5	2.905	12	..	19	.499	.82
Sept	51.4	73.6	30.2	43.4	20.2	29.7	15	62.50	21	40.40	24	52.0	1 380	4	..	26	.347	.83
Oct	41.9	73.0	23.0	50.0	19.0	39.3	2	60.16	26	30.60	22	50.0	1.860	13	3	15	.254	.84
Nov	36.0	56.8	19.0	37.8	13.1	23.0	4	47.00	27	27.70	28	37.0	1 220	5	8	17	.185	.86
Dec	24.8	42.1	-8.6	59.7	14.3	30.7	10	37.90	18	10.40	11	32.5	0.000	3	18	10	.122	.81
Sum or M'n	° 44.07	Aug ° 82.4	Jan. ° −18.6	° 45.97	° 16.13	Oct. ° 39.3	July 16	° 73.10	Jan 16	° -3.85			29.575	97	56	213		

1841.

Month	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warmst day. Date.	Temp.	Coldest day. Date.	Temp	Toronto Bay. Date.	Temp.	Rain in inches.	No. of days. Rain.	Snow	Fair.	Elasticity.	Humidity.
	°	°	°	°	°	°		°		°		°						
Jan.	25.5	42.3	-6.4	48 7	11.0	36.8	7	38.60	4	7.30	28	32 0	2.150	2	14	15	Im-per-	fect.
Feb.	23.2	44.1	-1.3	45.4	15.6	32.0	22	35.50	11	6.70	27	31.0	0.000	1	9	18	.107	.80
Mar	28.2	54.6	-6.7	61.3	16.6	27.6	20	45.10	15	11.80	25	33.5	1.170	5	7	19	.131	.79
Apr	39.4	61.8	19.9	41.9	14.1	28.9	26	52.40	10	28.60	22	41.5	1,370	3	3	24	.173	.70
May	51.1	78.0	26.5	51.5	19 0	28.8	24	61.10	3	32.60	29	66 8	2.350	11	1	19	.259	.67
Jun.	66.0	93.1	45.3	47.8	20.8	32.1	29	77.00	12	55.60	24	65.0	1.560	9	..	21	.453	.72
July	65.5	89.0	39.9	49.1	23.1	28.6	23	75.20	30	58.40	22	72.0	8.150	10	..	21	.450	.74
Aug	64.6	84.8	45.7	39.1	19.8	26 8	17	70.40	21	59.90	28	70.0	6,170	9	..	22	.483	.81
Sept	61.5	80.2	37.7	42.5	15.8	26.6	9	70.42	27	47.82	23	66.5	3.310	9	..	21	.453	.83
Oct.	41.8	59.7	20.6	39.1	16.8	24.0	11	50.90	25	28.63	21	45.5	1,360	6	2	23	.210	.78
Nov	35.4	63.8	8.5	55.3	11 7	19.3	1	54.75	29	19 95	27	35 5	2.450	8	5	17	.173	.81
Dec	29.9	46.1	3.1	43.0	11.2	21.1	14	41.95	21	11.12	23	33.0	6,600	7	5	19	.153	.86
Sum or M'n	° 44.34	Jun ° 93.1	Mar ° -6.7	° 47.31	° 16.54	Jan ° 36.8	Jun 29	° 77.00	Feb 11	° 6.70		° 49.61	36.670	80	46	239	..	..

1842.

Month	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily	Warmst day. Date.	Temp.	Coldest day. Date.	Temp.	Toronto Bay. Date.	Temp.	Rain in inches.	No. of days. Rain.	Snow.	Fair.	Elasticity.	Humidity.
	°	°	°	°	°	°		°		°		°						
Jan.	27.9	49.4	1.9	47.5	17.80	36.1	29	41.23	3	11.82	20	31.5	2.170	5	9	17	.130	.81
Feb.	27.9	50.2	2.9	47.3	15.27	27.7	3	43.42	17	11.03	26	34.5	3.625	8	9	11	.138	.84
Mar	36.3	70.3	15.1	55.2	15.55	32.7	30	47.47	12	21.70	24	37.5	3.150	4	8	19	.162	.76
Apr	43.4	89.8	20.1	69.7	15.38	52.1	22	63 45	1	31.53	21	49 0	3.740	8	2	20	.200	.71
May	49.8	71.2	27.3	46.9	21.12	31.9	18	59.34	9	41.12	28	58.5	1.275	7	..	24	.227	.61
Jun.	56.4	76.0	28.1	47.9	21.30	33.3	30	65.74	11	45.32	23	63.5	5.755	15	..	15	.348	.76
July	64.7	91.0	42.5	48.5	23.99	34.9	26	73.91	6	55.85	21	71.0	3.059	4	..	27	.438	.73
Aug	65.9	81.8	43.9	37.9	18.60	28.9	25	72.68	1	57.92	27	70.5	2.500	6	..	25	.491	.70
Sept	55.6	82.6	27.9	54.7	18.14	30.1	1	72.85	22	36.66	22	56.5	6.160	12	..	18	.350	.78
Oct.	45.3	68.6	27.5	41.1	17.31	26.9	7	56.93	20	37.27	20	49 0	5.175	8	..	23	.250	.83
Nov	33.2	56 8	8.1	48.7	13.46	23.6	1	45.74	25	19.03	26	31.4	5.310	9	10	11	.173	86.
Dec	25.8	40.5	4.1	36.4	13.10	32.1	2	31 74	22	9.57	22	33.0	0.850	3	17	11	.116	.77
Sum or M'n	° 44.34	July ° 91.0	Jan. ° 1.9	° 48.48	° 17.58	Apr ° 52.1	July 26	° 73.91	Dec. 22	° 9.57	..	° 49.32	42.790	89	55	221	.252	.77

1843.

Month.	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warmst day. Date.	Temp.	Coldest day. Date.	Temp.	M. windy day. Date.	Force.	M. Rainy day. Date.	Inches.	Inches of Rain.	Snow.	No. of days. Rain.	Snow.	Fair.	Mean force Wind.
	°	°	°	°	°	°		°		°		lb.								lb.
Jan	28.76	55.4	1.8	53.6	12.52	27.1	21	40.78	3	11.67	31	3.40	31	2.500	4.295	11.2	6	12	13	0.69
Feb.	15.92	38.5	-9.4	47.9	14.88	21.6	10	28.51	16	4.96	6	1.33	..	...	0.175	14 4	1	21	6	1.05
Mar	22.36	39 9	-2.5	42.4	17.08	29.2	10	32.52	2	12.45	31	1.81	..	...	0.625	25.7	2	18	11	1.18
Apr	41.29	71.6	14.7	56.9	16.10	33 4	28	55.48	1	26.12	18	2.31	..	...	3.185	0.1	7	3	20	1.46
May	49.73	79.8	29.2	50.6	20.32	33.8	15	63.10	1	38.61	..	..	..	...	1.570	..	5	..	21	0.52
Jun.	58.94	83.3	28.2	55.1	20,15	30.9	27	71.68	1	40.32	..	..	9	1.220	4.595	..	12	..	18	0.27
July	61.58	86.8	38.7	48.1	23.57	33.1	18	72.28	11	55.81	..	..	17	1.799	4.605	..	8	..	23	0.14
Aug	66 49	83.1	44 0	39.1	21.87	28.9	31	74.01	1	59.16	..	..	27	3.250	4.850	..	4	..	27	0.12
Sept	58.98	89.0	32.2	56.8	17.91	39.9	2	74.11	27	40.92	13	2.48	14	3.106	9.760	..	10	..	20	0.57
Oct.	41.92	68.0	24.2	43.8	14.45	22.2	6	56.72	27	31.17	3	2.30	7	1.765	3.790	2.5	12	4	15	0.54
Nov	33.25	52.6	14.1	38.5	11.48	20.0	24	39.95	27	20.95	17	2.80	17	2.020	4.765	1.2	10	7	13	0.59
Dec	30.83	48 5	3.1	45.4	9 64	21.2	20	37.53	12	12.55	12	2.40	..	...	1.040	9.1	6	8	17	0.53
Sum or M'n	° 42.75	Sept ° 89.0	Feb. ° −9.4	° 48.18	° 16.66	Sept ° 39.9	Sept 2	° 74.11	Feb. 16	° 4.96	Mar 31	lb. 4.81	Aug 27	3.250	43.555	66.2	83	73	209	0.58

1844.

Month.	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warmst day. Date.	Temp.	Coldest day. Date.	Temp.	M. windy day. Date.	Force.	M. Rainy day. Date.	Inches.	Inches of Rain.	Snow	No. of days. Rain.	Snow.	Fair.	Mean force Wind.
	°	°	°	°	°	°		°		°		lb.								lb.
Jan.	20.67	45.3	-7.2	52.5	14.05	32.9	16	37.45	25	0.28	13	1.92	12	1.415	3.005	24.9	7	11	13	0.70
Feb.	27.72	47.9	0.6	47.3	15.28	24.8	20	38.33	9	12.04	27	2.27	26	0.445	0.430	10.0	4	7	18	.43
Mar	31 83	50.8	9.6	41.2	14.59	26.0	1	40.90	18	16.63	15	1.62	12	0.730	2.476	14.0	8	8	15	.57
Apr	48.11	74.6	14.9	59.7	20.79	35.9	13	59.08	1	32.79	..	..	23	0.385	1.515	in'p	10	1	19	.21
May	54.22	78.4	28.7	49.7	21.00	32.8	25	65.88	21	40.87	..	..	11	1.660	5.670	..	11	..	17	.30
Jun.	69.41	83.3	33.2	50.1	20.69	40.6	18	70.62	10	49.91	..	..	19	1.030	3.535	..	9	..	21	.19
July	66.08	86.6	40.1	46.5	22.96	33.0	31	72.75	4	56.05	..	..	21	0.799	2.815	..	12	..	19	.19
Aug	61.16	86 8	43.5	43.3	19.75	31.7	16	71.30	27	57.49	..	..	..	..	..	..	17	..	11	.16
Sept	58.47	81.8	28.2	53.6	20.57	44.6	20	70.06	27	40.57	21	2.12	..	..	..	..	4	..	26	.26
Oct.	43.66	71.6	15.9	55 7	16.67	29.9	9	55.21	28	28.40	18	2.97	14	0.710	1.245	12.0	7	4	20	.43
Nov	31.92	56.0	12.1	43.9	13 45	27.5	7	43.30	27	17.42	23	2.63	..	..	..	8.0	8	4	18	.48
Dec	28.93	48.5	1.6	46.9	14.48	32.8	6	35.84	17	17.96	23	2.85	..	..	..	4.2	6	6	19	.40
Sum or M'n	° 44.68	Aug ° 86.8	Jan., ° -7.2	° 49.20	° 17.86	Sept ° 44.6	July 31	° 72.75	Jan 25	° 0.28	Oct 18	lb. . 97	May 11	1.660	Imper fect.	73.1	106	41	219	0.36

1845.

Month.	Temperature. Mean.	Max.	Min.	Range.	Range. Mean. Daily.	Greatest Daily.	Warmst day. Date.	Temp.	Coldest day. Date.	Temp.	M. windy day. Date.	Force.	M. Rainy day. Date.	Inches.	Inches of Rain.	Snow.	No. of days. Rain.	Snow.	Fair.	Mean force Wind.
	°	°	°	°	°	°		°		°		lb.								lb.
Jan.	26.68	45.7	-0.2	45.9	13 81	25.4	3	37.58	31	7.36	25	2.96	..	...	...	22.7	5	9	17	0.70
Feb.	26.45	49.1	-4.2	53.3	11.24	39.8	25	42.64	1	7.02	5	7.25	..	...	...	19.0	5	9	14	.99
Mar	35.65	59.8	6 6	53.2	16.37	29.3	31	51.68	15	20.65	15	2.02	..	...	...	2.8	5	8	18	.66
Apr	42.13	66.7	15 5	51.2	17.86	29.7	24	56 30	7	21.70	2	3.61	30	1.310	3.290	1.5	11	4	15	1.00
May	50.23	77.8	27.8	50.0	22.31	34.5	12	65.01	29	37.26	7	1.62	15	0.858	2.300	..	8	..	23	.55
Jun.	61.32	84.6	39.6	45.0	21.10	31 7	9	69.77	6	52.00	..	..	10	1.250	3.715	..	11	..	19	.27
July	66.74	95.0	45.7	49.3	22.41	31.5	12	82.32	30	55.95	..	..	..	...	2.195	..	7	..	21	.30
Aug	67.86	84.8	41 5	43.3	21.43	31.7	9	73.16	1	59.58	..	..	..	...	1.725	..	9	..	22	.19
Sept	55.91	79.6	34.0	45.6	20.43	31 5	3	67.62	24	48.10	..	..	20	1.020	6.245	..	16	..	14	.34
Oct.	46.49	64.0	19.7	44.3	18,33	28.8	10	57.65	21	28.50	..	..	..	...	1.760	in'p	11	1	19	.26
Nov	36.45	59.5	7.6	51.9	12.60	25.8	18	50.25	28	13.84	27	1.89	..	...	1.105	5.0	7	4	19	.53
Dec	21.49	39.7	-2.4	42.1	13.77	28.7	17	31.58	11	5.10	18	2.16	..	...	...	4.7	2	12	17	.70
Sum or M'n	° 44.79	J'ly ° 95.0	Feb ° −4.2	° 47.92	° 17.89	Feb. ° 39.8	July 12	° 82.32	Dec 11	° 5 10	Feb 5	lb. 7 25	Apr 30	1.310	Imper fect.	55.7	97	47	221	lb. 0.51

Public Libraries.—Munich has seventeen public libraries, into every one of which strangers unquestioned may enter, peruse, and depart in peace. Of these institutions the most celebrated are lending libraries. Statistics preach where sermon does not lift its voice. Here are its words. In London, there are, in round numbers, 500,000 volumes accessible to the public, or about an average of 22 volumes to every 100 inhabitants. Dublin with all its deficiencies, has 59. In Paris, the proportion is 160 volumes to every 100 inhabitants; in Berlin, 182; in Florence, 317; in Copenhagen, 467; in Dresdren, 490; in Munich 780. So that Paris is six times better provided than London; Berlin, 7 times; Florence, 13 times; Copenhagen, 19 times; Dresden, 20 times; and Munich, 32 times.—*Correspondent of the Builder.*

1846.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't day. Date.	Warm't day. Temp.	Coldest day. Date.	Coldest day. Temp.	M. windy day. Date.	M. windy day. Force.	M. Rainy day. Date.	M. Rainy day. Inches.	Inches of Rain.	Inches of Snow.	No. of days. Rain.	No. of days. Snow.	No. of days. Fair.	Mean force Wind.
	o	o	o	o	o	o		o				lb.								lb.
Jan.	26.10	44.0	-1.3	45.3	13,95	29.3	30	36.12	17	9.27	6	1.68	2	0.700	2.335	6.0	5	10	16	0.55
Feb.	20.80	41.9	-16.7	58.6	18.98	34.5	3	35.09	26	-3.68	19	3.45	..	0.000	none	46.1	0	13	15	.65
Mar	33.43	49.6	7.8	41.8	14.93	24.3	12	39.79	2	17.11	24	2.24	13	0.710	1.965	2.3	9	5	17	.30
Apr	44.11	81.8	24.2	57.6	16.34	39.6	21	57.78	13	31.24	28	1.66	28	0.610	1.300	1.3	10	2	18	.55
May	55.77	79.7	33.1	46.6	17.97	32.2	27	68.08	11	41.70	9	1.93	15	1.900	4.375	..	9	..	22	.46
Jun	63.82	84.2	39.1	45.1	18.46	26.9	30	73,05	6	51.64	20	1.36	18	0.765	1.920	..	10	..	20	.32
July	68.22	94.6	44.5	50.1	20.85	33.1	10	78.82	14	56.47	10	0.72	29	1.490	2.895	..	9	..	22	.29
Aug	68.41	86.4	49.5	36.9	17.78	25.4	5	78.67	18	57.44	10	0,49	13	0.320	1.770	..	9	..	22	.17
Sept	63.41	84.3	37.3	47.0	16.23	27.5	2	74.85	26	57.51	9	1.23	25	1.570	4.595	..	11	..	19	.33
Oct.	44.81	70.1	20.7	49.4	14.60	31.0	7	63.58	22	30.61	31	2.81	13	1.760	4.180	in'p	14	2	15	.41
Nov	40.82	55.7	18.0	37.7	9.60	23.7	10	52.41	25	20.35	26	4.10	8	1.450	5.805	0.4	12	2	16	.64
Dec	27.61	49.4	3.9	45.5	10.72	21.9	2	40.91	15	15.64	3	2.48	7	0.495	1.215	6.0	5	9	17	.57
Sum or M'n	o 46.44	July o 94.6	Feb. o -16.7	o 46.80	o 15.87	Apr o 39.6	July 10	o 78.82	Feb. 26	o -3.68	Nov 26	lb. 4.10	May 15	1.900	32.355	62.1	103	43	219	lb. 0.41

1847.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean. Daily.	Range. Greatest Daily.	Warmest day. Date.	Warmest day. Temp.	Coldest day. Date.	Coldest day. Temp.	M. windy day. Date.	M. windy day. Force.	M. Rainy day. Date.	M. Rainy day. Inches.	Inches of Rain.	Inches of Snow.	No. of days. Rain.	No. of days. Snow.	No. of days. Fair.	Mean force Wind.
	o	o	o	o	o	o		o		o		lb.								lb.
Jan	22.87	42.9	-2.9	45.8	11.64	32.3	15	39.67	21	8.07	4	2.75	4	1,100	2 135	7.5	7	5	19	1.09
Feb.	22.48	41.1	-0.9	42.0	12.42	26.1	2	37.65	23	6.60	3	1.22	4	0.480	0 550	27.3	2	13	13	.69
Mar	26.25	43 9	5.1	38 5	13.21	23.1	25	37.13	11	15.41	27	3.03	20	0.395	0.850	4.2	5	6	20	.71
Apr.	39.06	65,1	9.3	55.8	14 02	25.8	21	55.05	1	28.12	17	1.66	22	1.070	2.870	4.0	8	2	20	.59
May	51.55	72.1	26 7	45.4	17.25	29.8	28	62.41	1	39.90	31	1.58	31	0.465	2.040	..	12	..	19	.29
Jun.	58.13	77.8	36 0	41.8	15.84	29.0	26	69.88	14	45 70	14	2.31	1	0.520	2 625	..	14	..	16	.30
July	67.62	87.0	43.2	43.8	18.69	30.6	19	76.86	26	53 97	26	0.75	17	0.950	3.355	..	8	..	23	.19
Aug	63.93	82.6	44 6	38.0	17.95	26.2	16	72.77	31	54.06	18	0.71	17	0.785	2.140	..	10	..	21	.19
Sept	54.91	74 5	35 0	39.5	14.16	24.8	8	64.37	14	45.43	13	0.99	8	2.650	6.665	..	15	..	15	.33
Oct.	43 71	61.6	20.2	41.4	13.31	25.3	5	59.13	26	26.24	25	0.47	6	1.180	4.390	in'p	13	2	16	.19
Nov	38.04	57.9	8.4	49 5	9.62	21.4	2	51.45	29	13.89	27	0.95	14	0.700	3.155	in'p	14	3	13	.35
Dec.	30.02	49.6	-0.3	49.9	9.10	22.7	31	43.43	20	12.29	21	1.04	2	0.360	1.185	6.8	7	8	16	.35
Sum or M'n	o 43.46	J'ly o 87.0	Jan o -2 9	o 44.53	o 13.91	Jan. o 32.3	July 19	o 76.86	Feb 23	o 6.60	Feb 3	lb. 4.22	Sept 8	2.650	31.960	o 49.8	115	39	211	lb. 0.41

1848.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M. Windy Day. Date.	M. Windy Day. Velocity	M. Rai'y Day. Date.	M. Rai'y Day. Inches.	Inches of Rain.	Inches of Snow.	No. of Days. Rain.	No. of Days. Snow.	No. of Days. Fair.	M'n Vel. Wind.
	o	o	o	o	o	o		o		o										
Jan	27.41	51.1	-11.	62.5	12.42	31.4	1	41.27	10	-4.50	18	12.35	14	0.830	2.245	7.1	7	8	16	5.82
Feb.	26.28	46.6	0.0	46.6	12.78	23.5	21	38.02	11	10.88	6	12.65	4	.410	0.775	10.8	4	8	17	5.69
Mar	28.66	61.6	0.0	61.6	12.31	28.3	31	46.55	14	9.80	4	10.91	20	.715	1.220	9.7	5	6	20	5.80
Apr.	40.67	65.1	22.7	42.4	17.25	31.5	10	54.35	15	29.70	18	10.97	1	.970	1.455	0.5	5	1	24	4.89
May	53.71	78.0	31.2	46.8	18.54	31.5	20	63.13	13	39.90	30	10.68	13	.435	2.520	..	13	.	18	4.93
Jun.	62.54	92.0	37.4	54.6	20.02	44.0	15	77.43	12	49.21	7	9.54	4	.760	1.810	..	8	.	22	4.51
July	65.37	82.2	44.1	38.1	17.22	29.3	20	73.47	1	51.70	7	11.31	22	.310	1.890	..	10	.	21	4.91
Aug	68.31	87.0	48.7	38.3	18.25	30.2	14	76.65	1	61.10	4	8.41	4	.455	0.855	..	8	.	23	4.55
Sept	53.39	80.4	28.1	52.3	17.77	30.5	4	68.90	26	38.00	1	9.80	18	.620	3.115	..	11	.	19	5.81
Oct.	46.38	61.8	21.5	37.3	12.57	30.1	16	57.00	18	34.15	17	10.91	31	.360	1.550	..	11	.	20	4.60
Nov	33.61	49.0	15.9	33.1	9.22	19.4	4	42.27	9	21.78	30	10.65	24	.915	2.020	1.4	9	3	18	4.81
Dec.	29.12	48.8	-1.1	49.9	11.06	26.7	8	42.20	22	10.15	2	15.30	1	1.280	2.750	16.5	7	7	17	5.44
Sum or M'n	o 41.63	Jun o 92.0	Jan. o -11.4	o 46.96	o 14.95	Jun o 44.0	Jun 15	o 77.43	Jan 10	o -4.50	Dec. 2	o 15.30	Dec. 1	1.280	22.205	46.0	98	33	235	5.15

1849.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M. Windy Day. Date.	M. Windy Day. Velocity	M. Rai'y Day. Date.	M. Rai'y Day. Inches.	Inches of Rain.	Inches of Snow.	No. of Days. Rain.	No. of Days. Snow.	No. of Days. Fair.	M'n Vel. Wind.
	o	o	o	o	o	o		o		o		o								
Jan.	18.49	39.5	-14.	53.7	11.45	31.2	25	35.61	11	-2.10	15	14.66	25	0.820	1.175	9.2	4	10	17	6.71
Feb.	19.99	40.6	-9.8	50.4	11.02	24.1	28	36.50	15	2.67	8	14.49	24	0.230	0.240	19.2	2	13	13	6.58
Mar	33.24	53.0	15.1	37.9	11.33	31.6	30	41.11	3	20.67	14	12.97	20	1.130	1.525	2.3	7	2	22	5.37
Apr.	38.74	72.0	15.5	56.5	13.95	38.3	30	49.66	14	24.23	15	15.63	23	0 675	2 655	1.7	10	2	18	7.50
May	48.30	72.2	27.9	44.3	13.60	28.7	21	57.17	2	39.25	5	9.31	22	1.050	5.115	..	16	..	15	5.33
Jun.	63.01	84.4	35.2	49.2	16.59	31.9	21	74.60	5	52.77	4	7.53	15	0.990	2.020	..	7	..	23	3.32
July	67.82	88.6	47.3	41.3	19.85	29.7	12	78.27	31	59.25	11	6.81	25	2.030	3.415	..	4	..	27	3.52
Aug	65.08	79.0	45.2	33.8	18.15	27.5	30	70.37	31	56.68	9	8.53	20	1.045	4.970	..	10	..	21	3.76
Sept	57.04	80.1	32.7	47.4	16.01	27.9	5	68.37	27	45.18	22	8.02	6	0.450	1.480	..	9	..	21	4.23
Oct.	44.94	58.9	25.2	33.7	13.16	24.4	16	54.07	31	28.71	6	13.25	6	3 360	5.965	In'p	13	1	17	4.76
Nov	41.87	56.4	24,2	32.2	9.19	22.2	5	53.46	28	29.77	8	17.20	21	0.730	2 815	1.0	10	2	18	4.79
Dec.	26.56	40.8	-6.5	47.3	9.63	25.8	20	37.11	26	12.43	6	12.67	16	0.270	0.840	9.6	5	12	14	6.23
Sum or M'n	o 43.76	July o 88.6	Jan. -14.2	o 43.97	o 13.66	Apr. o 8.3	July 12	o 78.27	Jan. 11	o -2.10	Nov 8	17.20	Oct. 6	3.360	32.215	43.0	97	42	226	5.17

1850.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M. Windy Day. Date.	M. Windy Day. Velocity	M. Rai'y Day. Date.	M. Rai'y Day. Inches.	Inches of Rain.	Inches of Snow.	No. of Days. Rain.	No. of Days. Snow.	No. of Days. Fair.	M'n V. Wind.
	o	o	o	o	o	o		o		o										
Jan	29.26	46.4	9.9	36.5	11.63	22.0	25	37.29	14	17.88	12	12.51	10	0.360	1.250	5.2	5	8	18	5.80
Feb	26 58	49.6	1.2	48.4	15 41	29.2	26	38.82	4	7.52	14	16.05	28	0.500	1.235	23 1	7	9	12	7.61
Mar	29.73	46.5	7.2	39.3	14.41	29.8	14	39.08	20	19.01	1	11.55	13	0.410	0.745	11.2	2	7	22	7.62
Apr.	38.30	65 7	18.0	47.7	15.90	26.7	27	53.08	8	25 83	14	13.08	3	2.350	4.720	1.1	7	2	21	7.64
May	48,61	77 8	27.5	50.3	19.94	30.7	28	64.05	20	37 02	17	12.73	19	0.270	0.545	In'p	7	1	23	6.32
Jun.	61.86	85.6	31.2	51.4	22.03	40.8	19	73.35	1	53.12	11	11.43	20	1 505	3.345	..	10	..	20	4,54
July	69.04	86.2	54 6	31.6	18.22	27.0	24	75.58	26	60.10	6	8.05	17	2.750	5.270	..	12	..	19	4.56
Aug	66.55	85.0	44.0	41.0	17.29	31.2	7	73.80	27	55.66	31	7.76	13	2.100	4.355	..	13	..	18	4.46
Sept	56.54	76.0	29.5	46 5	20.10	32.1	23	67.48	30	46.20	28	9.57	1	0.430	1.735	..	11	..	19	4.78
Oct.	45.60	66.7	22.4	44.3	17.80	35 4	17	55 49	29	33.37	26	11.51	10	0.640	2.085	..	10	..	21	5.30
Nov	38.77	62.8	11.0	51.8	15 50	26.0	5	54.82	22	27.53	17	14.86	27	1.420	2.955	In'p	7	1	22	5.27
Dec.	22.75	48.8	-9.0	57.8	11.83	32.1	3	40.01	30	8.22	23	16.64	2	0.140	0.190	29.5	2	18	11	7.40
Sum or M'n	o 41.72	July o 86 2	Dec. o -9.0	o 46.05	o 16 67	Jun o 40.8	July 24	o 75.58	Feb 4	o 7.52	Dec 23	16.64	July 17	2.750	28.430	70.1	93	46	226	5.94

1851.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M. Windy Day. Date.	M. Windy Day. Velocity	M. Rai'y Day. Date.	M. Rai'y Day. Inches.	Inches of Rain.	Inches of Snow.	No of Days. Rain.	No of Days. Snow.	No of Days. Fair.	M'n Vel. Wind.
	o	o	o	o	o	o		o		o										
Jan.	25.82	43.4	-12.8	56.2	13.91	32.8	9	37.87	30	-1.25	29	16.99	16	0.585	1.275	7.8	4	10	17	7.69
Feb.	28.42	50.2	1.2	49.0	10.31	30.0	20	38.48	6	10.75	8	14.15	21	0.570	2.600	2.4	7	4	17	6.94
Mar	33.14	59.3	12.0	47.3	12.98	25.7	27	52.26	3	22.16	18	15.31	5	0.640	0.770	8.8	3	9	19	7.65
Apr.	41.67	59.3	25.8	33.5	12.87	21.6	24	50.22	11	31.81	19	14.73	5	0.650	2.295	1.2	11	3	16	8.07
May	52.48	73.3	28.0	45.3	16.05	26.3	13	61.35	2	37.53	1	14.46	10	0.790	2.050	0.5	12	1	18	6.34
Jun.	59.84	79.2	37.0	42.2	16.28	29.8	26	68.45	3	50.97	2	9.93	21	1.090	2.695	..	11	..	19	4.42
July	65.53	82.7	46.5	36.2	14.70	24.2	17	73.43	3	57.75	28	7.42	9	1.155	3.625	..	12	..	19	4.13
Aug	63 71	79.8	42.1	37.7	17.14	30.4	7	69.73	27	55.60	4	10.51	4	0.390	1.360	..	10	..	21	4 62
Sept	60.08	86.3	32.0	54.3	17.34	30.0	12	75.48	24	43.52	20	13.81	22	0.610	2.665	..	9	..	21	5.45
Oct.	47.83	66.2	25.2	41.0	13.86	22.7	11	57.80	27	32.22	3	10.18	20	0.320	1.680	0.3	10	2	19	4.39
Nov	32.80	50.2	13.8	36.4	9.58	22.8	1	44.42	11	24.08	2	9.57	29	2.770	3.885	6.7	5	6	19	4.70
Dec.	21 58	41.0	14.8	58.8	12.01	27.2	30	39.35	26	0.83	19	14.30	27	0.325	1.075	10.7	6	15	10	7.37
Sum or M'n	o 44.41	Sept o 86.3	Dec. -14.8	o 44.93	o 13.92	Jan. 32.8	Sept 12	o 75.48	Jan 30	-1.25	Jan 29	16.99	Nov 20	2.770	26.875	38.4	100	50	215	5.99

New Planets.—A new Planet, resembling a Star of the 12th magnitude, was discovered by Professor Gasparis of Naples, on the evening of the 5th of April, 1853. The position of the Planet, when discovered, was in the Constellation Leo, in R. A. about 11h. 4m., and Decl. 6° 50′. Another Planet was discovered by M. Chacornac, at Marseilles, on the 6th of April. It resembles a Star of the 9th magnitude, and is of a bluish colour. A third Planet was discovered by Mr. Luther, at Bilk, on the 5th of May; thus making 26 members of the Asteroida Group.

Boomerang Propeller.—On a second trial of the Boomerang Propeller, in the Steamship *Genova*, the speed obtained was 10¾ knots by the log. the revolutions of the engines, being from 56 to 58, a gain of more than one knot per hour on the speed by the common screw.—*Mining Journal.*

1852.

Month.	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warm't Day Date.	Temp.	Coldest Day Date.	Temp.	M.Windy Day. Date.	Velocity	M.Rai'y Day Date.	Inches.	Inches of Rain.	Snow.	No of Days. Rain.	Snow.	Fair.	M'n Vel. Wind.
	°	°	°	°	°	°		°		°										
Jan.	18.51	37.3	-10.	17.9	10.91	21.2	29	34.58	20	0.85	6	18.36		none	0·0	30.9	0	19	12	7.67
Feb.	23.82	41.2	-6.2	47.4	13.20	27.2	4	37.30	18	2.73	20	15.76	10	0.550	0.650	13.0	3	11	15	6.42
Mar	27.79	44.8	-6.0	50.8	11.00	34.1	13	39.98	2	12.70	30	15.99	13	0.850	3.080	19.5	8	12	11	5.81
Apr.	38.29	53.8	20.0	33.8	10.76	19.5	21	47.58	3	27.48	5	18.42	30	1.025	1.990	9.4	6	4	20	6.68
May	51.67	73.3	32.0	41.3	17.03	30.8	21	61.82	20	41.18	17	9.99	29	0.550	1.125	In'p	7	1	23	4.00
Jun.	60.88	86.1	37.2	48.9	18.08	29.4	15	71.33	10	48.10	22	12.28	9	0.625	3.160	..	10	..	20	1.09
July	66.68	90.1	48.5	41.6	18.33	29.3	21	76.72	31	56.47	30	10.16	29	1.860	4,025	..	8	..	23	3.33
Aug	65.35	81.2	45.8	35.4	15.77	21.9	23	72.92	2	57.38	27	8.39	6	1.055	2.695	..	9	..	22	3.30
Sept	56.92	81.8	35.8	46.0	17.76	28.4	2	71.53	29	44.07	12	9.20	20	1.160	3.630	..	10	..	20	4.60
Oct.	48.09	70.7	23.8	46.9	15.69	26.5	2	59.57	16	36.58	29	10.52	29	1.825	5.289	..	12	..	19	4.47
Nov	35.80	50.4	18.2	32.2	9.61	20.4	1	43.97	24	25.65	12	13.91	25	0.570	1.775	2.0	7	3	20	6.50
Dec.	32.27	51.0	13.2	37.8	9.96	22.2	7	47.65	21	16.72	17	14.11	27	1.100	3.995	20.1	7	10	14	6.54
Sum or M'n	° 43.84	July ° 90.1	Jan. —° 10.6	° 42.50	11.20	Mar 34.1	July 21	° 76.72	Jan 20	° 0.85	Apr 5	° 18.42	July 29	1.860	31.405	94.9	87	60	219	5.28

1853.

Month.	Temperature. Mean.	Max.	Min.	Range.	Range. Mean Daily.	Greatest Daily.	Warm't Day Date.	Temp.	Coldest Day Date.	Temp.	M.Windy Day. Date.	Velocity	M.Rai'y Day Date.	Inches.	Inches of Rain.	Snow.	No. of Days. Rain.	Snow.	Fair.	M'n Vel. Wind.
	°	°	—°	°	°	°		°												
Jan.	22.98	40.9	9.7	50.6	11.16	40.9	11	32.55	26	3.72	21	13.58	8	0.290	0.290	7.5	1	6	21	6.31
Feb.	21.06	43.4	-1.4	41.8	11.19	35.1	4	37.58	7	11.20	23	16.75	27	0.510	1.030	12.6	4	15	9	7.29
Mar	30.65	56.3	-0.1	56.4	11.82	26.0	30	43.95	15	12.65	11	15.16	17	0.110	1.080	7.1	6	8	17	5.87
Apr.	41.92	65.7	25.0	40.7	11.07	28.8	28	57.05	14	33.37	8	10.71	13	0.715	2.625	1.0	10	1	19	5.20
May	50.87	78.4	32.2	46.2	14.19	28.4	28	65.07	19	41.23	19	10.77	22	1.400	1.420	In'p	17	1	13	5.11
Jun.	65.19	89.5	39.2	50.3	19.71	32.8	14	75.22	25	51.48	23	7.98	26	0.895	1.550	...	9	..	21	3.67
July																				
Aug																				
Sept																				
Oct.																				
Nov																				
Dec.																				
Sum or M'n																				

GENERAL ABSTRACT.

Year.	Temperature. Mean.	Max.	Min.	Range.	Greatest D'ly Range. Date.	Range.	Warmest Day Date.	Temp.	Coldest Day. Date.	Temp.	Most Windy Day Date.	Force or Velocity	Most Rainy Day Date.	Inches.	Inches of Rain.	Snow.	No. of Days. Rain.	Snow.	Fair.	Frost every Month except	Indian Summer.	Yel'w matter fell in Rain.	First Snow.	Toron to Bay frozen over.	Toron to Bay clear of ice.
	°	°	°	°		°		°		°															
1840	44.07	82.4	-18.6	101.0	Oct. 13	39.3	July 16	73.10	Jan. 16	3.85	..	..	July 13	1.890	29.575	not re-	97	56	213	June, July & Aug	Nov. 1 to 5.	Jun. 26	Oc. 21	Dec. 6	Mar 29
1841	44.34	93.1	-6.7	99.8	Jan. 18	36.8	Jun. 29	77.00	Feb. 11	6.70	not reco	rded.	Aug 11	2.340	36.670	corded	80	46	239	J'e Ju'y A'g&S'p	Oc. 29 to No 2	not ob.	Oc. 16	Dec 18	Apr 12
1842	44.34	91.0	x1 9	89.1	Apr. 23	52.1	July 26	73.94	Dec 22	9.57	..	lbs.	Sept 12	2.380	42.790		89	55	221	July and August.	Oc. 28 to No. 4	Ju'e 30	Nov 16	not ob.	Mar 17
1843	42.75	89.0	-9.4	98.4	Sept 22	39.9	Sept. 2	71.11	Feb. 16	4.96	Mar 31	4.81	Aug 27	3.250	43.555	66.2	83	73	209	July, Aug & Sept	Oct. 23 to 25.	Ju'e 21	Oc. 17	Dec 13	Apr 23
1844	44.68	86.8	-7.2	94.0	Sept 22	44.6	July 31	72.75	Jan. 25	0.28	Oct. 18	2.97	May 11	1.660	imp'r.	73.1	106	41	219	June, July & Aug	Oct. 22 to 26.	Ju'e 17	Oc. 19	Dec 18	not ob.
1845	44.79	95.0	-4.2	99.2	Feb. 12	39.8	July 12	82.32	Dec. 11	5.10	Feb. 5	7.25	Apr. 30	1.310	imp'r.	55.7	97	47	221	J'e Ju'y A'g&S'p	Oct. 24 to 29	J. 14, 15	Oc. 15	Dec 3	not ob
1846	46.44	94.6	-16.	111.3	Apr. 21	39.6	July 10	78.82	Feb. 26	-3.68	Nov 26	4.10	May 15	1.900	32.355	62.1	103	43	219	June, July & Aug	Nov. 4 to 7.	J. 1, 18	Oc. 17	Dec 11	Apr. 8
1847	43.46	87.0	-2.9	89.9	Jan. 16	32.3	July 19	76.86	Feb. 23	6.60	Feb. 3	4.22	Sept. 8	2.650	31.960	19.8	115	39	211	J'e, Ju'y, A'g&S'p	Oct. 28 to 31	J. 18, 20	Oc. 11	Dec 26	Apr 19
1848	44.63	92.0	-11.	103.4	Jun. 15	41.0	Jun. 15	77.43	Jan. 16	-4.50	Dec. 2	15.30	Dec. 1	1.280	22.205	16.9	98	33	23.	June, July & Aug	Nov. 20 to 23	Ju. 20	Nov. 8	Dec 2	Mar 31
1849	43.76	88.6	-14.	102.8	Apr. 8	38.3	July 12	78.27	Jan. 11	-2.10	Nov 8	17,20	Oct. 6	3.360	32.215	13.0	97	42	226	June, July & Aug	Nov. 13 to 18	J. 22, 28	Oc. 31	Dec 26	Mar 29
1850	44.72	86.2	-9.0	95.2	June 3	40.8	July 24	75.58	Feb. 4	7.52	Dec 23	16.61	July 17	2.750	28.430	70.1	93	46	226	June, July & Aug	Nov. 7 to 13.	Ju. 20	Nov 16	Dec 13	Apr. 3
1851	44.41	86.3	-14.	101.1	Jan. 29	32.8	Sept 12	75.18	Jan. 30	-1.25	Jan. 29	16.99	Nov 20	2.770	26.875	38.4	100	50	215	June, July & Aug	Oct. 6 to 11.	J. 21, 22	Oc. 25	Dec 13	Mar 21
1852	43.84	90.1	-10.	100.7	Mar. 7	34.1	July 21	76.72	Jan. 20	0.85	Apr. 5	18.42	July 29	1.860	31.405	94.9	87	60	219	June, July & Aug	Nov. 16 to 21	J. 17, 24	Nov 11	Jan. 5	Apr 17
1853																									
M'n	° 44.33	° 89.39	—° 9.52	° 98.91		° 39.57	July 23	° 76.34	Jan. 24	° 2.02	Lbs. Miles.	4.67 16.91		2.262	32.549	59.93	96	48	221	June, July & Aug	Oc. 29 to No 3	Ju. 20	Oc. 27	Dec 18	Apr. 5

Proportion of Wind, in the Cardinal Directions, in Miles.

DIRECTION.	1848.	1849.	1850.	1851.	1852.	MEAN.
North.	16093.0	17400.2	18769.9	18473.3	15372.9	17221.9
West.	19686.0	17945.4	21766.5	22088.5	19485.7	20170.4
South.	12179.0	10315.1	12025.7	13322.1	11390.5	12026.5
East.	8249.0	11373.3	12118.0	12736.7	11982.6	11351.9

Toronto Observatory.

Latitude, 43°.39.4 North. Longitude, 79°.21.5 West.—Elevation above Lake Ontario, 108 feet.—Approximate elevation above the Sea, 342 feet.

CALCULATED AND ARRANGED FROM THE ORIGINAL OBSERVATIONS AND PRIVATE MEMORANDA, BY SERJEANT JAMES WALKER, ROYAL ARTILLERY.

Plastic Material for Forming various Objects.—Professor Purkinje recommends the following compound for the above purpose:—"Five parts of sifted whiting are mixed with a solution of one part of glue. When the whiting is worked up into a paste with the glue, a proportionate quantity of Venetian turpentine is added to it, by which the brittleness of the paste is destroyed. In order to prevent its clingingto the hands whilst the Venetian turpentine is being worked into the paste, a small quantity of linseed oil is added from time to time. The mass may also be colored by kneading in any color that may be desired. It may be pressed into shapes, and used for the production of bas-reliefs and other figures, such as animals, &c. It may also be worked by hand into models, during which operation the hands must be rubbed with linseed oi; the mass must also be kept warm duringthe process. When it cools and dries, which takes place in a few hours, it becomes as hard as stone, and may then be employed for themultiplication of these forms.—*Gewerbebl. aus Wurtemb.*

TINNING IRON.—Articles intended for tinning must first be rendered perfectly clean by immersion for a short time in a bath of 4 lbs. muriatic acid to three gallons of water, exposure for a short time at a red heat, steeping 10 or 12 hours in a dye of bran, and pickling (as it is called) in dilute sulphuric acid for about an hour. They are then rinsed with water, scoured with hemp and sand, and left in a bath of pure water until wanted. These various operations require some experience to manage them rightly. The plates, are then dried by rubbing with bran, and left singly, for about an hour, in pots of melted grease, which should have been slightly burnt. They are then removed with the grease adhering to them, into the metal bath, consisting of equal parts of block and grain tin, covered with grease, enough to form a layer about 4 inches deep. The bath is heated so as almost to inflame the grease. In about 90 minutes they are taken out, and plunged into another bath of pure grain tin; then rubbed with a peculiar hempen brush, plunged again into the second bath, and finally in a pot of melted tallow. Saucepans are generally tinned by cleaning the inside perfectly, heating the vessel, pouring in some melted tin, and rolling it about, rubbing the tin all over the surface with tow. Powdered resin is used to prevent the formation of oxide.—*Artizan.*

INDEX.

LIST OF PLATES AND WOOD CUTS.

Directions to Binder.